

Mathematics Tutorial Ia (1.0credits) (数学演習 1 a)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	RICHARD Serge Charles Designated Professor		

Course Purpose

The aim of this course is to deepen the understanding of calculus and to cultivate the ability to apply mathematical knowledge. The course is mainly intended for students taking Calculus I. Students will have the opportunity to manipulate the various notions introduced during the lectures.

Prerequisite Subjects

Calculus I

Course Topics

Exercises sheets will be provided each week before the tutorial, and will be available on the web site of the course. Homework will be due every week during the tutorial. For more information: <http://www.math.nagoya-u.ac.jp/richard/fall2020.html>

Textbook

Free reference books and lecture notes are available on the website of the course

Additional Reading

Free reference books and lecture notes are available on the website of the course

Grade Assessment

Your final grade will be determined by homework (50%) and quizzes (50%). The grading scale will be: A+: 95 - 100, A: 80 - 94, B: 70 - 79, C: 65 - 69, C: 60 - 64, F: 0 - 59.

Notes

Some basic knowledge on calculus from high school is assumed, including differentiation and integration of polynomial functions.

Contacting Faculty

Email to : richard@math.nagoya-u.ac.jp

Mathematics Tutorial Ib (1.0credits) (数学演習 1 b)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	Erik Darpö Designated Associate Professor		

Course Purpose

The aim of this course is to provide essential mathematical knowledge necessary to further study mathematics and other sciences at university level. The course is intended for students taking Linear algebra I.

Prerequisite Subjects

The course is intended for students taking Linear algebra I.

Course Topics

Linear systems, Gaussian elimination, matrices, vectors, linear maps, matrix multiplication, the inverse of a linear map, subspaces of \mathbb{R}^n , image and kernel, linear independence, bases, dimension, coordinates, orthogonal bases, the Gram-Schmidt algorithm, QR factorization, orthogonal complement, orthogonal maps, least square approximations.

Textbook

Otto Bretscher: Linear Algebra with Applications, fourth edition, Pearson 2009. ISBN: 978-0-13-600926-9

Additional Reading

Grade Assessment

The assessment of this course coincides with the assessment of the course Linear Algebra I.

Notes

High-school level mathematics.

Contacting Faculty

Fundamental Physics Tutorial Ia (1.0credits) (物理学基礎演習 1 a)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	SHIGEMORI Masaki Designated Professor		

Course Purpose

This is the companion course to the lecture course Fundamentals of Physics I on introductory calculus-based mechanics. It offers exercises to cultivate the ability to analyze and solve problems, as well as presentation and discussion skills so as to participate effectively in discussions among peers and instructors, leading to mastering the concepts introduced in the lecture course. Therefore students taking the lecture course are expected to register for this tutorial course.

Prerequisite Subjects

Fundamentals of Physics I; Calculus I

Course Topics

See syllabus for Fundamentals of Physics I

Textbook

Students are required to purchase the online Fundamentals of Physics Extended 10th Edition International Student Version with WileyPLUS Set (John Wiley & Sons, 2010 ISBN:9780470576083) [However, do not purchase it before the first class meeting where further details will be announced in class]

Additional Reading

order it during a class as needed

Grade Assessment

Grading Attendance and Class participation: 40% Assignments and Quizzes: 60% Class attendance is required. Absentee must give a valid reason, supported with document. A student will receive an "Absent" grade if he is absent 2 or more times without valid reason.

Notes

Contacting Faculty

By appointment. Please email instructors to make an appointment.

Fundamental Physics Tutorial I b (1.0credits) (物理学基礎演習 1 b)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	TAMA Florence Muriel Professor		

Course Purpose

This is a companion course to Fundamental Physics II, and offers practical exercises for mastering the concepts introduced in the lecture courses. Students taking the lecture courses should also take this tutorial class

Prerequisite Subjects

Related Courses Calculus I; Fundamentals of Physics I ; Fundamentals of Physics II

Course Topics

Course Contents See syllabus for Fundamental Physics II.

Textbook

Fundamentals of Physics Extended 10th Edition International Student Version with WileyPLUS Set (John Wiley & Sons, 2010 ISBN: 9781118230749)

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Grading Weekly assignments; attendance; class participation. (Weighting to be advised.) Criteria for “Absent” & “Fail” Grades • Class attendance is required. Absentees must give a valid reason (e.g. doctor’s certificate). A student who is absent from more than 3 sessions will receive zero for the semester attendance mark. • The “Absent” grade is reserved for students who withdraw by November 16. After that day, a letter grade will be awarded based on marks earned from all assessment during the semester.

Notes

Contacting Faculty

By email: florence.tama@nagoya-u.jp

Mathematics Tutorial II a (1.0credits) (数学演習 2 a)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	1 Spring Semester	1 Spring Semester	1 Spring Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	RICHARD Serge Charles Designated Professor		

Course Purpose

The aim of this course is to deepen the understanding of calculus and to cultivate the ability to apply mathematical knowledge. The course is mainly intended for students taking Calculus II.

Prerequisite Subjects

Calculus II, G30 program

Course Topics

Exercises sheets will be provided each week before the tutorial, and will be available on the web site of the course. Homework will be due every week during the tutorial.

Textbook

No textbook is required for this tutorial.

Additional Reading

No reference book is required for this tutorial.

Grade Assessment

Your final grade will be determined by homework (40%) and quizzes (60%).

Notes

Contacting Faculty

Email to : richard@math.nagoya-u.ac.jp

Mathematics Tutorial II b (1.0credits) (数学演習 2 b)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	1 Spring Semester	1 Spring Semester	1 Spring Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	Erik Darpo Designated Associate Professor		

Course Purpose

The objective of this course is to provide essential mathematical knowledge necessary to further studies in mathematics and science at university level. The course is primarily intended for students taking the course Linear algebra II.

Prerequisite Subjects

Linear Algebra II

Course Topics

Orthogonal maps, vector spaces, determinants and their applications, eigenvalues and eigenvectors, applications of eigenvalue theory, linear differential equations.

Textbook

do not appoint the textbook

Additional Reading

Otto Bretscher: Linear Algebra with Applications, fourth edition, Pearson

Grade Assessment

Explained during the first class

Notes

Contacting Faculty

Email: darpo@math.nagoya-u.ac.jp

Fundamental Physics Tutorial II a (1.0credits) (物理学基礎演習 2 a)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	1 Spring Semester	1 Spring Semester	1 Spring Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	John A. WOJDYLO Designated Professor		

Course Purpose

The aims of this course are to deepen students' understanding of basic Physics of electricity and magnetism and to cultivate their ability to apply Physics knowledge to problem-solving.

Prerequisite Subjects

Fundamentals of Physics

Course Topics

1. Electric Charge and Electric Fields 2. Gauss' Law 3. Electric Potential 4. Capacitance, Current, Resistance and Circuits 5. Magnetic Fields 6. Induction and Inductance It is desirable to read a textbook or reference materials before a class

Textbook

Fundamentals of Physics David Halliday, Robert Resnick, Jearl Walker John Wiley & Sons Inc

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Class attendance is required. Absentee must give a valid reason. Class Attendance: 10%; Assignments, quizzes and other assessment (written, presentation, etc.): 90%

Notes

Contacting Faculty

Fundamental Physics Tutorial II b (1.0credits) (物理学基礎演習 2 b)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	1 Spring Semester	1 Spring Semester	1 Spring Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	Bernard GELLOZ Designated Associate Professor		

Course Purpose

The aims of this course are to deepen students' understanding of basic Physics of waves and optics, and to cultivate their ability to apply Physics knowledge.

Prerequisite Subjects

Fundamentals of Physics

Course Topics

1. Oscillations 2. Introduction to Maxwell's Equations 3. Waves 4. Electromagnetic Waves 5. Images 6. Interference & Diffraction
It is desirable to read a textbook or reference materials before a class

Textbook

Fundamentals of Physics David Halliday, Robert Resnick, Jearl Walker John Wiley & Sons Inc

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Class attendance is required. Absentee must give a valid reason. Class Attendance: 10%; Assignments, quizzes and other written assessment: 90%.

Notes

Contacting Faculty

Analytical Chemistry (2.0credits) (分析化学)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	SAMJESKE Gabor arwed Designated Professor

Course Purpose

The course will introduce the fundamentals of analytical chemistry and mainly focuses on classical but still widely used wet chemical methods, combined with an overview of the instrumental techniques used in contemporary chemical analysis.

Prerequisite Subjects

Fundamentals in Chemistry I, II. Laboratory in Chemistry

Course Topics

Analytical Chemistry will cover the following topics: Acid - base equilibria, Precipitation/gravimetry, Redox equilibria, Titration, Spectrochemical methods, Chromatography

Textbook

Gary D. Christian; "ANALYTICAL CHEMISTRY, 7TH EDITION"; 2013; Publication Hoboken, N.J.: John Wiley & Sons

Additional Reading

Jack Barrett, "Inorganic Chemistry in Aqueous Solutions", RSC Publishing, 2003, ISBN 0-85404-471-X

Grade Assessment

Grading will follow the rules for G30 students who have entered NU before AY2020 (5 letter system): TOTAL 100% = 100 pts. Grades: "S" = 100 - 90% (> 90 pts), "A" = 89 - 80% (90 - 80 pts), "B" = 79 - 70% (79 - 70 pts), "C" = 69 - 60% (69 - 60 pts), "F" = 59 - 0% (< 60 pts). Face to face classes: Activity, homework: 10%, intermediate exam: 30%, final exam (comprehensive): 60%. On-line classes: Reports: 65%, final exam (on-line): 35%. The final exam is mandatory! Grades are final and calculated on the basis of the performances during class (reports in case of on-line classes) and in the two exams (one final exam in case of on-line classes) only. There will be no possibility to improve a grade after the final exam. Students who miss the final exam due to a (documented) illness, injury or other unavoidable reasons can ask the instructor.

Notes

Contacting Faculty

Either after the classes or during the office hours/by email (to be announced) E-mail: gsamjeske@chem.nagoya-u.ac.jp

Organic Chemistry I (2.0credits) (有機化学1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Jiyoung SHIN Professor

Course Purpose

The primary purpose of this course is to help students acquire a logical framework for understanding fundamental organic chemistry. This framework emphasizes how the organic molecular structures and the electron density configurations are related to patterns of chemical reactions. Based on the knowledge educated following the course contents, participants are expected to explain organic reaction sequences happening on the aliphatic substrates and solve progressive problems sequentially.

Prerequisite Subjects

Fundamentals of Chemistry I and II

Course Topics

Class 1. Structure Perspective of Organic Molecules --- Atomic Electron Configuration and Construction of Organic Molecules (Hybridization). Class 2. Projection of Molecular Structures of Organic Molecules and Classification of the Isomers --- Constitutional (Chain, Position, and Functional Group) Isomers and Stereoisomers (Diastereomers and Enantiomers). Class 3. Optical Activities of Stereoisomers and Assignment of Stereoisomeric Structures --- Fischer and Newman Projections; Absolute (R/S) and Optically Observed (D/L) Rotations; Specific Rotation and Enantiomeric Purity; Meso Compound. Class 4. Electron Density Configuration of Organic Molecules and Their Acidity/Basicity --- Formal Charges and Oxidation States; Acidity/Basicity and Electrophilicity/Nucleophilicity; Type of Chemical Reactions. Class 5. Potential Energy Profiles for Kinetically and Thermodynamically Favorable Reactions --- Stability of Carbocations, Carbanions, Hydrocarbon Radicals, and the Stabilization Factors (Hyperconjugation and Resonance). Class 6. Assessment of the Classes 1-5 with Practice Problems. Class 7. General Trends of Aliphatic Nucleophilic Substitutions and Bimolecular Reactions (SN2) --- Efficient Substrates and Proper Leaving Groups; Reactivity of Nucleophiles and Solvent Effect; Stereochemistry; Competing Reactions. Class 8. Unimolecular Aliphatic Nucleophilic Substitutions (SN1) --- Efficient Substrates and Proper Leaving Groups; Nucleophilicity and Solvolysis; Stability of Carbocation Intermediate; Stereochemistry; Competing Reactions. Class 9. Aliphatic Eliminations --- Unimolecular (E1 and E1CB) and Bimolecular (E2) Elimination; Thermodynamically and Kinetically favored (Zaitsev and Hofmann) Eliminations. Class 10. Types of Nucleophiles and Haloalkanes and Their Reaction Trends/Overview (Substitutions & Eliminations). Class 11. Assessment of the Classes 7-10 with Practice Problems. Class 12. Nomenclature of Organic Compounds --- Saturated/Unsaturated Hydrocarbons; Functional Groups; Aromatic Hydrocarbons; Stereochemical Assignments; Fused Rings (Spiroalkanes and Bicyclo/Tricycloalkanes). Class 13. Structures and Stereochemistry of Cycloalkanes and their Stability and Reactivity. Class 14. Preparation of Haloalkanes (Radical Reactions) --- Potential Energy Profiles of Reaction Coordinates. Class 15. Assessment of Overall Classes with Practice Problems (1-14).

Textbook

Organic Chemistry: Structure and Function (Seventh Edition), Peter C. Vollhardt and Neil E. Schore, (W. H. Freeman and Company), New York, 2014, Chapters 1-7.

Additional Reading

Organic Chemistry (second edition), Jonathan Clayden, Nick Greeves, and Stuart Warren (Oxford University Press), 2012 ISBN-10:0199270295.

Grade Assessment

Examination [Total 70%: two midterms (20% for each) and one final (30%)] and Assignment of Homework (30%): S(x90), A(90>x80), B(80>x70), C(70>x60), and F(60>x). The assessment methods will be

reconsidered due to the change of the pandemic condition.

Notes

Submission of "Course Withdrawal Request Form is necessary to withdraw the course. The student needs to contact the course instructor when the student wants to withdraw from the course. In the cases of any unavoidable reasons such as sickness, accident, or no attendance school, the student may get a grade of 'Absent' through the judgment of the course instructor and the student when the student submits a 'Course Withdrawal Request Form' to receive the 'Absent' grade. No submission of sickness/absence reports and lack of attendance score will result in an 'F' grade: It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s). This assessment can be reconsidered within pandemic conditions where the attendance can be replaced with the submission of assignments.

Contacting Faculty

Communication through email (instructor's e-mail: jyshin@chembio.nagoya-u.ac.jp and jyshin321@gmail.com) is available. Students are recommended to prepare each lecture by reading the corresponding chapter in the textbook and to review it by solving the related homework questions. Each assignment is due by the start of the next class.

Physical Chemistry I (2.0credits) (物理化学1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Peter BUTKO Designated Professor

Course Purpose

The purpose of this course is to grasp the physical basis of the interactions between particles and of the behavior and properties of matter. The course begins with perfect gas law, proceeds to thermodynamics, and finishes with applications of thermodynamics to simple mixtures.

Prerequisite Subjects

Fundamentals of Chemistry I and II

Course Topics

- 1 Gases and the Zeroth Law of Thermodynamics 1 (Ch. 1)/
- 2 Gases and the Zeroth Law of Thermodynamics 2 (Ch. 1)/
- 3 The First Law 1 (Ch. 2)/
- 4 The First Law 2 (Ch. 2)/
- 5 The Second and Third Laws 1 (Ch. 3)/
- 6 The Second and Third Laws 2 (Ch. 3)/
- 7 Midterm Exam (Chs. 1 - 3)/
- 8 Gibbs Energy and Chemical Potential 1 (Ch. 4)/
- 9 Gibbs Energy and Chemical Potential 2 (Ch. 4)/
- 10 Introduction to Chemical Equilibrium (Ch. 5)/
- 11 Equilibria in Single-Component Systems (Ch. 6)/
- 12 Equilibria in Multiple-Component Systems (Ch. 7)/
- 13 Electrochemistry and Ionic Solutions (Ch. 8)/
- 14 Pre-final Review/
- 15 FINAL EXAM (Chs. 1 - 8)

Textbook

David W. Ball: Physical Chemistry, 2nd Ed., Cengage Learning, 2015

Additional Reading

Atkins' Physical Chemistry, any edition

Grade Assessment

Two exams: the midterm (worth 50 points) and the final (comprehensive, worth 100 points), homework (40 points), and 10 points for activity in online communication with the instructor and the class. TOTAL: 200 points.
Grade "S": 100-90% (180 or more points), "A": 89-80% (179 - 160 pts), "B": 79-70% (159 - 140 pts), "C": 69-60% (139 - 120 pts), "F": 59-0% (fewer than 120 pts).

Notes

Contacting Faculty

E-mail: pbutko@chem.nagoya-u.ac.jp

Biochemistry I (2.0credits) (生化学 1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Seiji KOJIMA Professor Shunji NAKANO Lecturer

Course Purpose

The purpose of this course is to introduce the biomolecules and their contributions to life. The basic property of water, nucleic acid, amino acid and protein will be included in the lectures.

Prerequisite Subjects

Biochemistry II, III, and IV (Terms IV, V, and VI, respectively)

Course Topics

1. Life, cells, and thermodynamics
2. Physical and chemical properties of water
3. Overview of DNA structure, function and engineering
4. Amino acids: the building blocks of proteins
5. Polypeptide sequences, analysis, and evolution
6. Protein Structure and folding
7. Physiological activities of proteins
It is desirable to read a textbook or reference materials before a class

Textbook

1. Principles of Biochemistry by Voet, D., Voet, J.G. and Pratt, C.W., Wiley and son, Inc. USA. ISBN: 78-11809244-6, 4th edition
2. Biochemistry by Berg, Tymoczko, Stryer, 8th edition
3. Lehninger Principles of Biochemistry by Nelson and Cox, 7th edition.

Additional Reading

Recommended reading will be suggested in the class.

Grade Assessment

Evaluation will be based on in-class participation, quizzes, assignments and examinations. Presence will be marked. Lecture participation will be considered an important element in overall grading. Absent based on submission of Course Withdrawal Request Form. Fail based on "Failed" results of examinations and assignments.

Notes

Contacting Faculty

E-mail (Seiji Kojima: z47616a@cc.nagoya-u.ac.jp) or phone (052-789-2993).

Cell Biology I (2.0credits) (細胞学 1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Maria VASSILEVA Designated Associate Professor

Course Purpose

Aims: This course aims to develop students' foundation in basic cell organization. The course provides students with an overview of cell structure, proteins structure and function, and fundamental genetic processes in the cell.

Prerequisite Subjects

Fundamentals of Biology I

Course Topics

1. Basic cell organization; 2. Protein structure and function; 3. Structure of DNA and chromosomes; 4. DNA replication, repair and recombination; 5. DNA expression; 6. Control of gene expression; 7. Introduction to evolutionary biology; 8. Introduction to molecular biology methods. Assignments and preparations outside of class hours: students are required to prepare for each class by reading the assigned textbook content and preparing a short schematic summary of important concepts before class.

Textbook

Essential Cell Biology, B. Alberts et al., Garland Science.

Additional Reading

Becker's world of the cell, Hardin, Bertoni, Kleinsmith, Pearson. Molecular Biology of the Cell, B. Alberts et al., Taylor & Francis.

Grade Assessment

Evaluation is based on class participation, assignments and examinations. A total score of at least 60/100 is required to receive a passing grade.

Notes

Contacting Faculty

E-mail: mnvassileva@bio.nagoya-u.ac.jp

Analytical Mechanics I (2.0credits) (解析力学 1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Elective
Lecturer	SHIGEMORI Masaki Designated Professor

Course Purpose

This is the first of two courses in analytical mechanics. Analytical mechanics abstracts from Newtonian mechanics and generalizes it to a versatile framework that can be applied to various areas of physics, such as quantum mechanics, statistical mechanics, and relativity. After a survey of elementary principles, we discuss the core concepts of Lagrangian and Hamiltonian mechanics, with special emphasis on symmetry principles, followed by some explicit examples.

Prerequisite Subjects

Analytical Mechanics II, Quantum Mechanics I

Course Topics

1. Survey of elementary principles
2. Variational principles and Lagrangian mechanics
3. Symmetries and conservation laws
4. Hamiltonian mechanics
5. Central force problem
It is desirable to read a textbook or reference materials before a class

Textbook

H. Goldstein, C. Poole and J. Safko, "Classical Mechanics", Pearson; 3rd edition (2013), ISBN-10: 1292026553, ISBN-13: 978-1292026558

Additional Reading

L. D. Landau and E. M. Lifschitz, "Mechanics: Volume 1 (Course of Theoretical Physics)", Butterworth-Heinemann; 3rd edition (1976), ISBN-10: 0750628960, ISBN-13: 978-0750628969.
L. N. Hand and J. D. Finch, "Analytical Mechanics", Cambridge University Press (1999), ISBN-10: 0521575729, ISBN-13: 978-0521575720.

Grade Assessment

Quizzes 10%, homework 30%, midterm 30%, final exam 30%

Notes

Contacting Faculty

Join and check the NUCT website for Analytical Mechanics (AM1) for announcements.

Mathematical Physics I (2.0credits) (数理物理学 1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Elective
Lecturer	John A. WOJDYLO Designated Professor

Course Purpose

This course is a companion course to Mathematical Physics II. Students master analytical techniques for problems that arise in physics, engineering and chemistry. This course introduces first order and second order ordinary differential equations and their solution methods. Questions of uniqueness of solutions and convergence are also discussed. Students are also introduced to Fourier series, the Fourier transform, convolution, Laplace transform, and the Dirac delta function. Students will find this mathematical methods course helpful in other units such as Quantum Mechanics, Analytical Mechanics, Electricity and Magnetism, as well as in Automotive Engineering and other engineering courses. This course has dual aims: 1) to convey mathematical principles; 2) to improve students' technical ability i.e. ability to express intuition in mathematical terms and ability to solve problems.

Prerequisite Subjects

Calculus I; Calculus II; Linear Algebra I; Linear Algebra II, or Consent of Instructor
Mathematical Physics Tutorial I, Mathematical Physics II

Course Topics

- First order ordinary differential equation (ODE) initial value problems. Integration factor; separable equations; systems of ODEs (Hamiltonian systems); phase plane, flow. Uniqueness and existence theorems. Some differences between linear and nonlinear ODEs.
- Second order linear ODE initial value problems. Homogeneous solution. Proving linear independence (Wronskian). Method of Undetermined Coefficients; Variation of Parameters. Series solutions: ordinary point, regular singular point; convergence tests; Method of Frobenius. Examples from physics and engineering.
- Fourier series. Dirichlet conditions. Role of symmetry. Gibbs phenomenon. Effect of jump discontinuity on speed of convergence. Integration and differentiation of Fourier series.
- Fourier transform, convolution, Dirac delta function. Laplace transform.

Textbook

Boyce W., DiPrima R, Elementary Differential Equations, 7th 10th Ed., Wiley.

Additional Reading

1. Boas M.L., 2006, Mathematical Methods in the Physical Sciences, 3rd ed., John Wiley & Sons.
2. Strang, G., Introduction to Linear Algebra, 4th Edition, Chapter 6.3.
Arfken G.B. & Weber H.J., 2005, Mathematical Methods for Physicists, 6th ed., Elsevier Academic Press. (Copies are available in the library.)

Grade Assessment

Attendance: 5%; Weekly Quizzes and Assignments: 25%; Mid-term exam: 35%; Final Exam: 35%
The "Absent" grade is reserved for students who withdraw by November 16. After that day, a letter grade will be awarded based on marks earned from all assessment during the semester.

Notes

Contacting Faculty

Office: Science Hall 5F 517 Phone: 052-789-2307 Email: john.wojdylo@s.phys.nagoya-u.ac.jp

Mathematical Physics Tutorial I (1.0credits) (数理物理学演習 1)

Course Type	Basic Specialized Courses
Class Format	Exercise
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Elective
Lecturer	KITAHARA Teppei Designated Assistant Professor

Course Purpose

Students taking Mathematical Physics I should also take this tutorial class. This course introduces first-order and second-order ordinary differential equations and their solution methods. Students master exact and approximate analytical techniques for initial value problems that arise in physics, engineering and chemistry. Questions of existence, uniqueness and convergence are also discussed. Fourier series follow naturally from the 2nd-order theory and these are investigated, too.

Prerequisite Subjects

Calculus I, Calculus II, Linear Algebra I, Linear Algebra II; or Consent of Instructor

Course Topics

- First order ordinary differential equation (ODE) initial value problems. Integration factor; separable equations; systems of ODEs (Hamiltonian systems); phase plane, flow. Uniqueness and existence theorems. Some differences between linear and nonlinear ODEs.
- Second order linear ODE initial value problems. Homogeneous solution. Proving linear independence (Wronskian). Method of Undetermined Coefficients; Variation of Parameters. Series solutions: ordinary point, regular singular point; convergence tests; Method of Frobenius. Examples from physics, engineering and chemistry.
- Fourier series. Dirichlet conditions. Role of symmetry. Gibbs phenomenon. Effect of jump discontinuity on speed of convergence. Integration and differentiation of Fourier series.
- Fourier transform, convolution, Dirac delta function. Laplace transform.

Textbook

There is no designated textbook, but lecture materials will be handed out at every class.

Additional Reading

1. Boas M.L., 2006, *Mathematical Methods in the Physical Sciences*, 3rd ed., John Wiley & Sons.
2. Strang, G., *Introduction to Linear Algebra*, 4th Edition, Chapter 6.3. Arfken G.B. & Weber H.J., 2005, *Mathematical Methods for Physicists*, 6th ed., Elsevier Academic Press. (Copies are available in the library.)

Grade Assessment

tutorial Attendance: 50%; Class performance: 50% The "Absent" grade is reserved for students who withdraw by November 14. After that day, a letter grade will be awarded based on marks earned from all assessments during the semester.

Notes

Contacting Faculty

Instructor: KITAHARA Teppei
Office: ES Building, ES714
Phone: 052-789-2863
Email: teppei@kmi.nagoya-u.ac.jp

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Autumn Semester
Elective/Compulsory	Elective
Lecturer	HOSSAIN Akter Designated Lecturer

Course Purpose

The purpose of Statistical Physics I is to understand the basic laws that govern macroscopic bodies consisting of an enormous number of atoms and molecules. This first part of the course covers universal phenomenological laws, called thermodynamic laws, and their applications.

The main focus of this course is to understand the basic principles of classical thermodynamics which are the basis for macroscopic understanding of all the physical phenomena. The applications in automotive engineering are also introduced.

Prerequisite Subjects

Calculus

Course Topics

1. Thermal Equilibrium and Temperature
2. State Equations, Partial Differentials, Units and Dimensions
3. The First Law of Thermodynamics (energy, isothermal and adiabatic processes)
4. The Second Law of Thermodynamics
5. Entropy
6. Thermodynamic Functions
7. Phase Equilibrium and Chemical Equilibrium
8. Kinetic Theory and Statistical Mechanics

Remarks: To obtain an excellent grade of this course, you have to prepare yourself properly by allocating enough time (i.e., it is your own duty/responsibility) for the assignment and final examination outside the course hours using the printed handouts of the lecture materials.

Textbook

Printed handouts will be provided.

Additional Reading

Modern Engineering Thermodynamics; Robert T. Balmer; Academic Press (2010)

Grade Assessment

Grades will be based on class participation, assignments and a final examination.

30% for attendance

30% for assignments

40% for final examination

Notes

Contacting Faculty

Students can ask questions at any time during classes.

Questions during off-class hours can be asked at the lecturer's room (Engineering Building No.3 North Wing, Room 223 (3125) or via e-mail: akter.hossain@mae.nagoya-u.ac.jp

Inorganic Chemistry I (2.0credits) (無機化学 1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	SAMJESKE Gabor arwed Designated Professor

Course Purpose

Inorganic chemistry I is the first part of a three-semester course in inorganic chemistry consisting of parts I, II, and III. Aim of the three-semester course is to present principles and fundamentals of inorganic chemistry, to introduce chemical reactions and to show examples of the role of inorganic chemistry in the industry, environment and every day lives.

Prerequisite Subjects

Fundamentals of Chemistry I and II

Course Topics

The contents of Inorganic Chemistry I will cover the topics of the structure of the atom, orbitals, periodic system of the elements, bonding models, MO theory, symmetry, acids and bases. It is desirable to read a textbook or reference materials before a class

Textbook

Catherine E. Housecroft, Alan G. Sharpe; INORGANIC CHEMISTRY, 5TH EDITION; PEARSON - PRENTICE HALL

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Intermediate 30%, final exam: 70% TOTAL 100% = 100 pts.

Notes

Contacting Faculty

Either after the classes or during the office hours/by email (to be announced)E-mail:
gsamjeske@chem.nagoya-u.ac.jp

Organic Chemistry II (2.0credits) (有機化学 2)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Jiyoung SHIN Professor

Course Purpose

The primary purpose of this course is to acquire a logical framework for understanding fundamental organic chemistry. Many chemical reactions of organic compounds begin with nucleophile-electrophile interactions. This framework provides an influence for chemical reactions of the organic molecules having π -bonds. Based on the knowledge educated following the course contents, the participants are expected to understand organic reaction sequences happening with unsaturated organic molecules, including aromatic compounds, and solve the progressive problems sequentially.

Prerequisite Subjects

Fundamental Chemistries I and II, Organic Chemistry I

Course Topics

Class 1. Electron Configuration of Unsaturated Hydrocarbons and Their Reaction Trends --- Difference of Reactivity between Saturated and Unsaturated Aliphatic Hydrocarbons and Aromatic Hydrocarbons. Class 2. Nuclear Magnetic Resonance (NMR) Spectroscopy of Organic Molecules --- Level of Energy Source for Various Spectroscopy; Larmor Frequency and Quantized Energy; Spin Spinning and Applied Magnetic Field; Zeeman Effect and Resonances; Shielding and Deshielding; Downfield and Upfield; Chemical Shifts, Integration, and Peak Splitting; $[N+1]$ rule. Class 3. Preparations of Alkenes and Sequence of Electrophilic Additions of Alkenes --- Potential Energy Stability of Unsaturated Aliphatic Compounds and Electrophilic Additions; Preparations by E2 Elimination and Dehydration; Hydrogenation; Halogenations (toward Monohaloalkane, Dihaloalkane, Halohydrin, and Allylic halide) of Simple Alkenes and Conjugated Dienes. Class 4. Electrophilic Additions of Alkenes --- Hydration; Carbene Addition; Oxidation; Radical Addition; Heck Coupling; Polymerization. Class 5. Assessment of the Classes 1-4 with Practice Problems. Class 6. Reactions of delocalized π -systems (Diels-Alder Reactions and Electrocyclization) --- Efficient Dienes and Dienophiles; Stereochemistry in Diels-Alder Reactions (Endo/Exo cycloadditions and Endo Rule); Thermal and Photochemical Cyclization for Even- and Odd-Numbered Double Bonds. Class 7. Preparations of Alkynes and Sequence of Electrophilic Additions of Alkenes --- Hydrogenation; Halogenation; Hydration. Class 8. Delocalized π -Systems and Reactivity of Benzene --- Stability of Extended Conjugations and the Electron Configuration of Delocalized π -Systems (Nonaromatic/Aromatic/Antiaromatic Compounds); Projection of Resonances. Class 9. The reaction of Benzene --- Electrophilic Aromatic Substitutions (Halogenation, Nitration, Sulfonation, Friedel-Crafts Alkylation, Friedel-Crafts Acylation, Wolff-Kishner, and Clemmensen Reductions). Class 10. Assessment of the Classes 6-9 with Practice Problems. Class 11. Electrophilic Substitutions of Substituted Benzenes --- ortho & para- and meta-Directing Groups and the Reactivities Class 12. Nucleophilic Substitutions of Benzene (via Benzyne Formation or through Inductive Effects of Substituents). Class 13. Preparations of Multiply Substituted Benzenes --- Protection/Deprotection of amine; Reduction/Oxidation. Class 14. Electrophilic Substitutions of Fused Aromatic Compounds (Naphthalene and Anthracene). Class 15. Assessment of the Overall Classes (1-14) with Practice Problems.

Textbook

Organic Chemistry: Structure and Function (Seventh Edition), Peter C. Vollhardt and Neil E. Schore, (W. H. Freeman and Company), New York, 2014, Chapters 11-16 and 22

Additional Reading

Organic Chemistry (second edition), Jonathan Clayden, Nick Greeves, and Stuart Warren (Oxford University Press), 2012 ISBN-10:0199270295.

Grade Assessment

Examination [total 70%: two midterms (20% for each) and one final (30%)] and Assignment of Homework (30%): S($x \geq 90$), A($80 < x < 90$), B($70 < x < 80$), C($60 < x < 70$), and F($x < 60$). The assessment methods can be reconsidered following pandemic conditions.

Notes

Submission of "Course Withdrawal Request Form is necessary to withdraw the course. The student needs to contact the course instructor when the student wants to withdraw from the course. In the cases of any unavoidable reasons such as sickness, accident, or no attendance school, the student may get a grade of 'Absent' through the judgment of the course instructor and the student when the student submits a 'Course Withdrawal Request Form' to receive the 'Absent' grade. No submission of sickness/absence reports and lack of attendance score will result in an 'F' grade: It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s). This assessment can be reconsidered within pandemic conditions where the attendance can be replaced with the submission of assignments.

Contacting Faculty

Students are recommended to prepare each lecture by reading the corresponding chapter in the textbook and to review it by solving the related homework questions. Each assignment is due by the start of the next class. Students can communicate with the course instructor face-to-face, either in the class or through the appointment. Communication through emails (instructor's email: jyshin@chembio.nagoya-u.ac.jp and jyshin321@gmail.com) is also available.

Physical Chemistry II (2.0credits) (物理化学 2)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Peter BUTKO Designated Professor

Course Purpose

The purpose of this course is to learn what physical chemistry is all about and to grasp important principles and facts about physical chemistry. The focus is on statistical thermodynamics and its applications. The course finishes with a study of kinetics and dynamics of chemical reactions.

Prerequisite Subjects

Physical Chemistry I

Course Topics

Course Contents

- 1 Stat. Thermodynamics 1: The Concepts (Ch. 15)
- 2 Stat. Thermodynamics 2: Applications (Ch. 16)
- 3 Molecular Interactions 1 (Ch. 17)
- 4 Molecular Interactions 2 (Ch. 17)
- 5 Pre-exam Review & EXAM 1 (Chs. 15 – 17)
- 6 Macromolecules and Self-Assembly (Ch. 18)
- 7 Molecules in Motion 1 (Ch. 20)
- 8 Molecules in Motion 2 (Ch. 20)
- 9 The Rates of Chemical Reactions 1 (Ch. 21)
- 10 The Rates of Chemical Reactions 2 (Ch. 21)
- 11 Pre-exam Review & EXAM 2 (Chs. 18, 20 & 21)
- 12 Reaction Dynamics 1 (Ch. 22)
- 13 Reaction Dynamics 2 (Ch. 22)
- 14 Pre-final Review
- 15 FINAL EXAM (Chs. 15 – 18, 21 & 22)

It is desirable to read a textbook or reference materials before a class

Textbook

P. Atkins, J. de Paula & J. Keeler: Atkins' Physical Chemistry, 11th Ed., Oxford University Press, 2018

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Grading

Two exams: 100 points each, final exam (comprehensive): 200, homework: 50. TOTAL: 450.

Criteria for "Absent" & "Fail" Grades

The "Absent" grade is reserved for students that withdraw by the 6th lecture period. After that day, a letter grade will be awarded based on grades earned from all assignments during the semester.

Course Withdrawal

Yes. The last day to withdraw without academic penalty is the 6th lecture period.

Notes

Contacting Faculty

Office: SA Building 318-1 (Science & Agriculture)

Phone: 789-2480

E-mail: pbutko@chem.nagoya-u.ac.jp

Quantum Chemistry I (2.0credits) (量子化学 1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Peter BUTKO Designated Associate Professor

Course Purpose

What exactly is so special about Quantum Mechanics?" The purpose of this course is to introduce quantum mechanics. It begins with an introduction to elementary quantum mechanics and builds up to convey thorough theoretical understanding of atomic electronic structure.

Prerequisite Subjects

Fundamentals of Chemistry I and II, Fundamentals of Physics I to IV, Calculus I and II, Linear Algebra I and II, or permission of the instructor

Course Topics

- 1 From Classical to Quantum Mechanics (Ch. 1)
- 2 Wave Packets and the Schrodinger Equation (Ch. 2)
- 3 The Quantum Mechanical Postulates (Ch. 3)
- 4 Pre-exam Review & EXAM 1 (Ch. 1 – 3)
- 5 The Particle in the Box 1 (Ch. 4)
- 6 The Particle in the Box 2 (Ch. 5)
- 7 Commuting and Non-commuting Operators and the Uncertainty Principle (Ch. 6)
- 8 Harmonic Oscillator: Classical and Quantum Mechanical 1 (Ch. 7)
- 9 Harmonic Oscillator: Classical and Quantum Mechanical 2 (Ch. 7)
- 10 Pre-exam Review & EXAM 2 (Ch. 4 – 7)
- 11 The Vibrational and Rotational Spectroscopy of Diatomic Molecules 1 (Ch. 8)
- 12 The Vibrational and Rotational Spectroscopy of Diatomic Molecules 2 (Ch. 8)
- 13 The Hydrogen Atom (Ch. 9)
- 14 Pre-final Review
- 15 FINAL EXAM (Ch. 1 – 9)

It is desirable to read a textbook or reference materials before a class

Textbook

T. Engel: Quantum Chemistry and Spectroscopy, 3rd Ed. (International edition), Pearson, 2014

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Two exams: 100 points each, final exam (comprehensive): 200, homework: 50. TOTAL: 450.

The "Absent" grade is reserved for students that withdraw by the 6th lecture period. After that day, a letter grade will be awarded based on grades earned from all assignments throughout the semester.

Notes

Contacting Faculty

pbutko@chem.nagoya-u.ac.jp

Biochemistry II (2.0credits) (生化学 2)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Spring Semester
Elective/Compulsory	Elective
Lecturer	YOU Young-Jai Designated Professor

Course Purpose

We will continue to learn the biochemical basis of the living organism.

Prerequisite Subjects

Biochemistry I

Course Topics

1. Review of Biochemistry I: Nucleic acids and genome
2. Review of Biochemistry I: Amino acids and proteins
3. Enzyme properties and kinetics
4. Sugar and Lipids
5. Membrane and membrane transport
6. Signal transduction
It is desirable to read a textbook or reference materials before a class

Textbook

1. Biochemistry by Berg, Tymoczko, Stryer, 8th edition.
2. Principles of Biochemistry by Voet, D., Voet, J.G. and Pratt, C.W., Wiley and son 4th edition.
3. Lehninger Principles of Biochemistry by Nelson and Cox, 7th edition.

Additional Reading

Will be introduced in class

Grade Assessment

Evaluation will be based on in-class participation, assignments and examinations. Absent based on submission of Course Withdrawal Request Form. Fail based on "Failed" results of examinations and assignments.

Notes

Contacting Faculty

Oyjyou@bio.nagoya-u.ac.jp

Cell Biology II (2.0credits) (細胞学 2)

Course Type	Basic Specialized Courses		
Class Format	Lecture		
Course Name	Chemistry		
Starts 1	2 Autumn Semester		
Elective/Compulsory	Elective		
Lecturer	Maria VASSILEVA Designated Associate Professor	DAMNJANOVIC Jasmina Assistant Professor	Joyce A. CARTAGENA Designated Associate Professor

Course Purpose

Aims: this course provides students with knowledge on cellular membranes structure and its fundamental importance for cellular processes - intracellular transport, cell communication and responses to the environment. Furthermore, the course provides details on the mechanisms of how plant and animal cells generate energy.

Prerequisite Subjects

Fundamentals of Biology 1

Course Topics

1. Membrane structure and function 2. Intracellular Compartments and Transport; 3. Cell Communication; 4. How cells obtain energy from food 5. Energy Generation in Mitochondria and Chloroplasts. Preparation outside the class hours: students are required to prepare before class by reading the assigned textbook material and creating schematic summary of important concepts before class.

Textbook

Essential Cell Biology, B. Alberts et al., Garland Science.

Additional Reading

Becker's world of the cell, Hardin, Bertoni, Kleinsmith, Pearson. Molecular Biology of the Cell, B. Alberts et al., Taylor & Francis.

Grade Assessment

Evaluation is based on in-class participation, assignments and examinations. Passing grade requires a total cumulative grade of minimum 60/100.

Notes

Contacting Faculty

mnvassileva@bio.nagoya-u.ac.jp

Electricity and Magnetism (2.0credits) (電磁気学)

Course Type	Basic Specialized Courses	
Class Format	Lecture	
Course Name	Chemistry	Automotive Engineering
Starts 1	2 Spring Semester	2 Spring Semester
Elective/Compulsory	Elective	Compulsory
Lecturer	John A. WOJDYLO Designated Professor	

Course Purpose

This course is a solid introduction to electrostatics and magnetostatics. Maxwell's Equations are derived. The course also introduces students to fundamental mathematical methods required to solve problems in physics, engineering and applied mathematics. This course has dual pedagogical aims: 1) to convey physical principles; 2) to improve students' technical ability – i.e. ability to express physical intuition in mathematical terms and ability to solve problems.

Prerequisite Subjects

Calculus I&II; Fundamentals of Physics III&IV; Mathematical Physics II or Consent of Instructor. Physics Tutorial IIa

Course Topics

Course Contents • Revision of vector calculus, curvilinear coordinates, Dirac Delta Function. • Electrostatics. Coulomb's Law. Continuous Charge Distributions. Divergence and Curl of Electrostatic Fields. Field Lines, Flux, and Gauss's Law. Electric Potential. Poisson's Equation and Laplace's Equation. The Potential of a Localized Charge Distribution. Work and Energy in Electrostatics. Conductors. Induced Charges. Surface Charge and the Force on a Conductor. • Special Techniques. The Method of Images: point charge near a conducting plane or sphere, grounded or insulated. Separation of Variables. • Electric Fields in Matter. Polarization. Dielectrics. The Electric Displacement. Linear Dielectrics. • Magnetostatics. The Lorentz Force Law. The Biot-Savart Law. The Divergence and Curl of B. Applications of Ampere's Law. Magnetic Vector Potential A. What is “real”, A or B? • Magnetic Fields in Matter. Magnetization. Diamagnetism, Paramagnetism, Ferromagnetism. The Auxiliary Field H. Magnetic Susceptibility and Permeability. • Introduction to Electrodynamics. Electromotive Force. Electromagnetic Induction. Faraday's Law. Energy in Magnetic Fields. Maxwell's Equations. Magnetic levitation above a superconductor. It is desirable to read a textbook or reference materials before a class

Textbook

1. Griffiths, D.L., 2012, Introduction to Electrodynamics, 4th ed., Prentice Hall. Alternative textbook (HIGHLY RECOMMENDED -- many copies in the G30 section of the Science Library): 2. Nayfeh, M. H. & Brussel M. K., Electricity and Magnetism, Dover, 2015. (It is essential that students read at least one of these books. Nayfeh is much cheaper to buy and the explanations are clearer. It covers what we need for EM1.)

Additional Reading

Leighton, R.B. & Feynman, R.P., Feynman Lectures on Physics (Volume 2), Pearson. (Highly recommended alternative reading.)

Grade Assessment

Attendance: 5%; Weekly quizzes or other written assessment: 15%; Mid-term exam: 40%; Final Exam: 40% The “Absent” grade is reserved for students who withdraw by May 16. After that day, a letter grade will be awarded based on marks earned from all assessment during the semester.

Notes

Contacting Faculty

Office: Science Hall 5F 517 Phone: 052-789-2307 Email: john.wojdylo@s.phys.nagoya-u.ac.jp

Inorganic Chemistry II (2.0credits) (無機化学 2)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	SAMJESKE Gabor arwed Designated Professor

Course Purpose

Inorganic chemistry II is the second part of a three-semester course in inorganic chemistry I, II, and III. Aim of the three-semester course is to present principles and fundamentals of inorganic chemistry and also to show examples of the role of inorganic chemistry in the industry, environment and every day lives.

Prerequisite Subjects

Fundamentals of Chemistry I and II
Related Courses INORGANIC CHEMISTRY I

Course Topics

The contents of Inorganic Chemistry II will cover the topics of Metals & non-metals: Solid state Redox reactions Non-aqueous solvents, p-block element chemistry It is desirable to read a textbook or reference materials before a class

Textbook

Catherine E. Housecroft, Alan G. Sharpe; INORGANIC CHEMISTRY, 5TH EDITION; PEARSON - PRENTICE HALL

Additional Reading

Jack Barrett, "Inorganic Chemistry in Aqueous Solutions", RSC Publishing, 2003, ISBN 0-85404-471-X
Cotton, Wilkinson, "Advanced Inorganic Chemistry", John Wiley & Sons, Inc., ISBN 0-471-19957-5

Grade Assessment

Grading will follow the rules for G30 students who have entered NU before AY2020 (5 letter system): TOTAL 100% = 100 pts
Grades: "S" = 100 - 90% (> 90 pts), "A" = 89 - 80% (9 - 80 pts), "B" = 79 - 70% (79 - 70 pts), "C" = 69 - 60% (69 - 60pts), "F" = 59 - 0% (< 60 pts)
Face to face classes: Activity, homework: 10%, intermediate exam: 30%, final exam (comprehensive): 60%
On-line classes: Reports: 65%, final exam (on-line): 35%
The final exam is mandatory! Grades are final and calculated on the basis of the performances during class (reports in case of on-line classes) and in the two exams (one final exam in case of on-line classes) only. There will be no possibility to improve a grade after the final exam. Students who miss the final exam due to a (documented) illness, injury or other unavoidable reasons can ask the instructor.

Notes

Contacting Faculty

Either after the classes or during the office hours/by email (to be announced)
E-mail: gsamjeske@chem.nagoya-u.ac.jp

Structural Chemistry (2.0credits) (構造化学)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Hideo TAKAGI Associate Professor

Course Purpose

In this course, students will learn theoretical concepts that control structures and reaction pathways of chemical compounds without using complicated mathematics. For this purpose, students will learn basic concepts of the group theory in the first half of this course. Students will learn various point groups, structures of character tables, and basic mathematical techniques related to the group theory. Then students will learn first- and second-order Jahn-Teller effects that are related to the distortions of ground-state structures and the activation energy of chemical reactions. Finally, the students will learn symmetry rules that determine the pathways of reactions. By taking this course, students will understand (1) symmetry elements and symmetry operations of various point groups; (2) methods of mathematical calculations using character tables; (3) method to draw molecular orbital by obtaining group orbitals; (4) analyses of normal mode vibrations of simple molecules by leaning the whole molecule method and internal coordinate method; (5) judgment if a given dipole transition is allowed or not; (6) determination of ground-state structures of various compounds; and (7) judgment if a given reaction is allowed to proceed thermally/ photochemically or not. Students also learn about basic mathematics related to the projection operators and the Great Orthogonality Theorem.

Prerequisite Subjects

chemistry

Course Topics

1. Symmetry elements / operations and point groups
2. Structure of character tables, reducible and irreducible representations, and direct product
3. Kugel Group and subgroup
4. Application of Group Theory 1: group orbital and molecular orbital
5. Application of Group Theory 2: analyses of normal mode vibrations and basic concepts of IR / Raman spectroscopy
6. Application of Group Theory 3: judgments of electronic / IR / Raman transitions
7. Application of Group Theory 4: Jahn-Teller Theorem and structures of compounds
8. Application of Group Theory 5: Allowed and forbidden reactions; Adiabaticity of concerted processes; Symmetry Rules and Principle of Least Motion
It is desirable to read a textbook or reference materials before a class

Textbook

Theories for Structures and Reactions; A Practical Guide to the Physical Theories in Chemistry (by HDT)

Additional Reading

S.F.A. Kettle, Symmetry and Structure a Readable Group Theory for Chemists, Wiley, and other books referred to in the textbook.

Grade Assessment

Final examination (50%), assignments (50 %).

Notes

Contacting Faculty

E-mail / phone Phone: 789-5473 E-mail: h.d.takagi@nagoya-u.jp

Organic Chemistry III (2.0credits) (有機化学 3)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Jiyoung SHIN Professor

Course Purpose

The primary purpose of the course is to acquire a logical framework for understanding fundamental organic chemistry. This outline essentially provides the reactions of the organic compounds having critical functional groups, such as hydroxy, carbonyl, and amino groups, as well as their derivatives. Based on the knowledge educated following the course contents, the participants are expected to understand the reactions converting one functional group to another and solve the progressive problems sequentially.

Prerequisite Subjects

Fundamentals of Chemistries I and II, Organic Chemistries I and II

Course Topics

Class 1 & 2. Alcohols and Ethers --- Acidity/Basicity of Alcohols; Preparation of Alcohols (Nucleophilic Substitutions (SN1 & SN2), Reduction of Carbonyl Compounds, Hydrolysis of Esters); Reaction of Alcohols (Deprotonation, Substitution, Elimination, Oxidation, Inorganic Ester Formation); Preparation of Ethers (Williamson Ether Synthesis) and Reaction of Ethers. Class 3. Esters --- Inorganic and Organic Esters; Haloalkane Formation from Alcohols via Inorganic Esters; Reaction of Organic Esters (Hydrolysis, Lactones into Open Chain Ester, Esters into Amides and Alcohols, Reduction). Class 4. Acyl Halide --- Reactivity of Carbonyl Compounds (Leaving Ability of Leaving-Groups); Reaction of Acyl Halides (Conversion into Carboxylic acid, Anhydride, Ester, Amide, Ketone, Aldehyde, and Phenylalkanone). Class 5. Aldehydes and Ketones --- Preparations of Aldehydes and Ketones (Oxidation of Alcohols, Ozonolysis of Alkenes, Hydration of Alkynes; Friedel-Crafts Acylation) Class 6. Reactions of Aldehydes and Ketones --- Grignard Reaction; Hydration (in acid/base); Acetalization/Deacetalization; Thioacetalization/Dethioacetalization/Desulfurization. Class 7. Reactions of Aldehydes and Ketones --- Conversions into Cyanohydrin; Wittig Reaction; Baeyer-Villiger Oxidation; Conversion into Imine, Oxime, and Hydrazone; Reduction of Acyl Compounds into Alkanes. Class 8. Assessment of the Classes 1-7 with Practice Problems. Class 9. Enols and Enolates --- Reactivity and Reaction Trends of Carbonyl Compounds in Acid and Base Class 10. Reactivities of Formaldehyde, Aldehydes, and Ketones and Their Reactions --- Reactions with Amines (into Imine, Iminium, and Enamine) and Reaction Comparison; Mannich Reaction. Class 11. Reactions of Conjugated Aldehydes, Ketones, --- Preparation of Conjugate Carbonyl Compounds; 1,2-addition versus 1,4-addition; Soft and Hard Base Nucleophiles; Michael Additions; Robinson Annulation. Class 12. Carboxylic Acids --- Preparation of Carboxylic acids (Alcoholysis, Hydrolysis, Over Oxidation of Primary Alcohols, Reduction of CO₂, Conversion of Nitrile into Carboxylic Acid). Class 13. Reactions of Carboxylic Acids --- Hell-Volhard-Zelinsky Bromination; Acyl Chloride Formation; Anhydride Formation; Decarboxylation. Class 14. Intermolecular/Intramolecular Cross Condensations --- Aldol Condensation; Claisen Condensation; Retro-Claisen Condensation; Dieckmann Condensation. Class 15. Assessment of Overall Classes (1-14) with Practice Problems.

Textbook

Organic Chemistry: Structure and Function (Seventh Edition), Peter C. Vollhardt and Neil E. Schore, (W. H. Freeman and Company), New York, 2014, Chapters 8-9, and 17-20.

Additional Reading

Organic Chemistry (second edition), Jonathan Clayden, Nick Greeves, and Stuart Warren (Oxford University Press), 2012 ISBN-10:0199270295.

Grade Assessment

Organic Chemistry III (2.0credits) (有機化学 3)

Examination [total 70%: midterm (30%) and final (40%)] and Assessment of Homework (30%): Credits will be awarded to those students who score 60 or more. Grades are as follows: S($x \geq 90$), A($90 > x \geq 80$), B($80 > x \geq 70$), C($70 > x \geq 60$), and F($60 > x$). This assessment method can be reconsidered based on the pandemic condition.

Notes

Submission of "Course Withdrawal Request Form" is necessary to withdraw the course. The student needs to contact the course instructor when the student wants to withdraw from the course. In the cases of any unavoidable reasons such as sickness, accident, or no attendance school, the student may get a grade of 'Absent' through the judgment of the course instructor and the student when the student submits a 'Course Withdrawal Request Form' to receive the 'Absent' grade. No submission of sickness/absence reports and lack of attendance score will result in an 'F' grade: It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s). This assessment can be reconsidered within pandemic conditions where the attendance can be replaced with the submission of assignments.

Contacting Faculty

Communication through emails (instructor's e-mail: [jyshin@chembio.nagoya-u.ac.jp](mailto: jyshin@chembio.nagoya-u.ac.jp) and [jyshin321@gmail.com](mailto: jyshin321@gmail.com)) is available. Students are recommended to prepare each lecture by reading the corresponding chapter in the textbook and to review it by solving the related homework questions. Each assignment is due by the start of the next class.

Quantum Chemistry II (2.0credits) (量子化学 2)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Peter BUTKO Designated Professor

Course Purpose

We will employ the principles of quantum mechanics to study chemical bonding and molecular structure.

Prerequisite Subjects

Fundamentals of Chemistry I and II, Fundamentals of Physics I to IV, Calculus I and II, Linear Algebra I and II

Course Topics

1 Many-Electron Atoms (Ch. 10)2 Introduction to the Gaussian software3 Quantum States for Many-Electron Atoms and Atomic Spectroscopy (Ch. 11)4 The Chemical Bond in Diatomic Molecules 2 (Ch. 12)5 Pre-exam Review & EXAM 1 (Ch. 10 12)6 Molecular Structure and Energy Levels for Polyatomic Molecules 1 (Ch. 13)7 Molecular Structure and Energy Levels for Polyatomic Molecules 2 (Ch. 13)8 Electronic Spectroscopy 1 (Ch. 14)9 Electronic Spectroscopy 2 (Ch. 14)10 Pre-exam Review & EXAM 2 (Ch. 13 14)11 Molecular Symmetry 1 (Ch. 16)12 Molecular Symmetry 2 (Ch. 16)13 Pre-final Review14 FINAL EXAM (Ch. 10 16)It is desirable to read a textbook or reference materials before a class

Textbook

T. Engel: Quantum Chemistry and Spectroscopy, 3rd Ed. (International edition), Pearson, 2013

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Two exams: 100 points each, final exam (comprehensive): 200, homework: 50. TOTAL: 450.The "Absent" grade is reserved for students that withdraw by the 6th lecture period. After that day, a letter grade will be awarded based on grades earned from all assignments throughout the semester.

Notes

Contacting Faculty

Phone: 789-2480E-mail: pbutko@chem.nagoya-u.ac.jp

Earth and Planetary Science (2.0credits) (地球惑星科学)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Marc HUMBLET A. Designated Associate Professor

Course Purpose

In this course students will learn about the characteristics of the planets and other components of our solar system (orbital parameters, atmospheric conditions, internal structure and composition, geomorphology, geological activity). We will use the knowledge of our own planet Earth as a reference to understand processes occurring elsewhere. During the past fifty years, various spacecrafts and exploration vehicles have been used to considerably expand our knowledge of the solar system and send back to Earth ever more detailed pictures of distant worlds. The course will review the different means of space exploration and use abundant data acquired by past and ongoing missions to illustrate the characteristics of the planets. A recurrent topic throughout the course will be the fascinating question of the existence of extraterrestrial life and its detection. We will also discuss the future of space exploration.

Prerequisite Subjects

This course focuses on the geology of planets and moons, and therefore it is linked to Earth Science-related courses.

Course Topics

1. A brief history of astronomy
2. Introduction to the Solar System
3. Space exploration
4. The Earth-Moon system
5. Mercury
6. Venus
7. Mars
8. Jupiter
9. Saturn
10. Uranus, Neptune, and TNOs

Textbook

There is no required textbook for this course. Please refer to the recommended reading list below for interesting books related to the course content.

Additional Reading

Faure, G. & Mensing, T.M. (2007). Introduction to Planetary Science: The geological perspective. Springer, 546 pages.
Lang, K.R. (2011). The Cambridge Guide to the Solar System. 2nd edition, Cambridge University Press, 502 pages

Grade Assessment

Two quizzes: 20% (10% each)
Two short reports: 20% (10% each)
Oral presentation: 15%
Written essay: 45%
Students who enrolled in 2020 will be graded using the six-step A+, A, B, C, C-, and F grade evaluation system (A+:100-95%, A: 94-80%, B: 79-70%, C: 69-65%, C-: 64-60%, F: 59% or less).
Students who enrolled in 2019 or before will be graded following the five-step S-A-B-C-F grade evaluation system (S:90-100%, A: 80-89%, B: 70-79%, C:60-69%, F: 59-0%).

Notes

Contacting Faculty

Phone: 052-789-3037 / E-mail: humblet.marc@f.mbox.nagoya-u.ac.jp

Chemistry of Inorganic Materials I (2.0credits) (無機材料化学1)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	SAMJESKE Gabor arwed Designated Professor

Course Purpose

The purpose of this course is to understand the chemical and physical properties of various inorganic materials, their functions, and their applications.

Prerequisite Subjects

Inorganic Chemistry I, Fundamentals in Chemistry I + II

Course Topics

Solid State Chemistry

crystal structure

glass

defect

phase diagram

synthesis

bond

It is desirable to read a textbook or reference materials before a class

Textbook

- Solid State Chemistry and its Applications (2nd Edition, Student Edition), Anthony R. West; Wiley 2014

Additional Reading

Carter, Norton, "Ceramic Materials: Science and Engineering", Springer, 2nd Edition, ISBN 978-1-4614-3522-8

Grade Assessment

Grading will follow the rules for G30 students who have entered NU before AY2020 (5 letter system):

TOTAL 100% = 100 pts

Grades: "S" = 100 - 90% (> 90 pts), "A" = 89 - 80% (90 - 80 pts), "B" = 79 - 70% (79 - 70 pts), "C" = 69 - 60% (69 - 60

pts), "F" = 59 - 0% (< 60 pts)

Face to face classes: Activity, homework: 10%, intermediate exam: 30%, final exam (comprehensive): 60%

On-line classes: Reports: 65%, final exam (on-line): 35% The final exam is mandatory!

Grades are final and calculated on the basis of the performances during class (reports in case of on-line classes) and

in the two exams (one final exam in case of on-line classes) only. There will be no possibility to improve a grade after

the final exam. Students who miss the final exam due to a (documented) illness, injury or other unavoidable reasons

can ask the instructor.

Notes

Contacting Faculty

Either after the classes or during the office hours/by email (to be announced)

E-mail: gsamjeske@chem.nagoya-u.ac.jp

Quantum Chemistry III (2.0credits) (量子化学 3)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Kazuhiro FUJIMOTO Designated Associate Professor

Course Purpose

The accurate description of the electronic structure of large molecules is an important topic in the field of quantum chemistry, and is required for the accurate understanding of chemical phenomena. In this class, theoretical concepts for large-scale calculations will be covered.

Prerequisite Subjects

Quantum Chemistry I & II

Course Topics

1. Born-Oppenheimer approximation
2. LCAO-MO theory: Hartree-Fock theory
3. Electron correlation problem
4. Basis sets in quantum chemical calculations
5. Intermolecular interactions
6. Molecular mechanics
7. How to treat large number of particles (QM/MM, FMO, and DC)

It is desirable to read a textbook or reference materials before a class

Textbook

do not appoint the textbook

Additional Reading

Modern Quantum Chemistry: Introduction to Advanced Electronic Structure Theory (A. Szabo and N.S. Ostlund), Dover Publications, Inc.

Grade Assessment

Final examination and attendance

Notes

Contacting Faculty

Earth Environmental Science (2.0credits) (地球環境科学)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Marc HUMBLET A. Designated Associate Professor

Course Purpose

Never before have had humans such a profound impact on the Earth. The world population exceeds 7 billion and is growing steadily. Industrial and technological needs for energy and mineral resources are increasing every year. In this course, we will see how humanity is changing the environment. We will explore climate change in the geological past and the relationships between human activities and climate today. The students will also learn about the nature and usefulness of geological resources and the environmental threats posed by petroleum and mineral industries. Finally, we will reflect on the opportunities and challenges for a sustainable use of geological resources.

Prerequisite Subjects

Fundamental of Earth Science I & II

Course Topics

1. Introduction
2. Earth cycles 1: Nitrogen cycle
3. Earth cycles 2: Phosphorus cycle
4. Earth cycles 3: Water cycle
5. Earth cycles 4: Carbon cycle
6. Paleoclimatology
7. Recent climate change
8. Geological Resources: Energy, Rocks, and Minerals
9. Toward a sustainable future
It is desirable to read a textbook or reference materials before a class

Textbook

do not appoint the textbook

Additional Reading

order it during a class as needed

Grade Assessment

Two quizzes: 20% (10% each)
Two short reports: 20% (10% each)
Oral presentation: 20%
Written essay: 40%

Notes

Contacting Faculty

Office: Graduate School of Environmental Studies
Department of Earth and Planetary Sciences E516
Phone: 789-3037
E-mail: humblet.marc@f.mbox.nagoya-u.ac.jp

Chemistry and Biotechnology Laboratory 1 (3.0credits) (化学生命工学実験 1)

Course Type	Basic Specialized Courses
Class Format	Experiment
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

In order to cultivate academic skills, qualities, and abilities to develop engineering, it is necessary to acquire various experimental knowledge and operations. The aim of this experiment is to acquire basic experimental knowledge and operations in analytical chemistry and physical chemistry with backgrounds in subjects of chemical reactions, chemical equilibrium, thermodynamics, reaction kinetics, spectroscopy, electrochemistry, and computational chemistry. It also enhances the development of the ability to organize and analyze data and create reports.

By the end of this experiment, students should be able to do the following:

1. Acquire experimental operation on fundamentals of analytical chemistry and physical chemistry.
2. Deepen the understanding of chemical reaction, chemical equilibrium, thermodynamics, reaction kinetics, spectroscopy, electrochemistry, computational chemistry, etc.
3. Design experimental plans, organize and analyze data, and discuss results.
4. Create a logical report.
5. Acquire the foundation of applied and comprehensive skills required for future professional research.

Prerequisite Subjects

Elemental Chemistry I & II, Analytical Chemistry 1 & 2 with Exercises, Chemical Kinetics with Exercises, Thermodynamics 1 & 2 with Exercises, Structural Chemistry and Electrochemistry with Exercises, Quantum Chemistry 1 & 2 with Exercises, Safety in Laboratory

Course Topics

Experiment I. Titration experiment

Experiment II. Analytical chemistry experiment, Instrument analysis experiment, Physical chemistry experiment

The following themes are set as analytical chemistry experiment, instrumental analysis experiment, and physical chemistry experiment.

1. UV-Vis and fluorescence spectrophotometry, 2. Chromatography, 3. IR spectroscopy, 4. Gel electrophoresis, 5. Raman spectroscopy, 6. Electrochemistry, 7. Osmotic pressure, 8. Quantum chemical calculation, 9. Electron spin resonance, 10. X-ray diffraction. 11. TG and DTA, 12. Electron microscope

Read the experimental guideline before each experiment. In addition, a report task is assigned for each experiment. After organizing, analyzing, and considering the experimental results, submit it as a report by the submission deadline.

Textbook

Use an experimental guideline prepared for each topic. How to obtain the experimental guideline will be announced during the experiment guidance.

Additional Reading

Other instructions will be given as needed.

Grade Assessment

Chemistry and Biotechnology Laboratory 1 (3.0credits) (化学生命工学実験 1)

Grading will be decided based on the approach to the experiment (positiveness, activeness), logical thinking / judgment for the results, experimental skills and reports. Credits will be awarded to those students who score 60 or more out of 100 points. Grades are as follows:

Enrollees after 2020

A+: 100-95A: 94-80B: 79-70C: 69-65C-: 64-60F: 59-0

Enrollees before 2019

S: 100-90A: 89-80B: 79-70C: 69-60F: 59-0

Notes

It is assumed that you have earned credits for Safety in Laboratory.

Contacting Faculty

Professors and teaching assistants will answer the questions.

Chemistry and Biotechnology Laboratory II (3.0credits) (化学生命工学実験 2)

Course Type	Basic Specialized Courses
Class Format	Experiment
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

This laboratory class aims to learn fundamental experimental procedures on organic chemistry and biotechnology.

Prerequisite Subjects

Elemental Chemistry I & II, Organic chemistry 1 ~ 4 with Exercises, Biochemistry 1~ 3 with Exercises, Safety in Laboratory

Course Topics

* Safety in chemical laboratory

* Basic organic chemistry

1. spectroscopy in organic chemistry, 2. separation and synthesis of olefin compounds and reactivity of olefinic bond, 3. separation and purification of organic compounds, 4. identification of unknown compounds

* Basic Biotechnology

1. bacterial culture, 2. enzyme reaction

Textbook

Use an experimental guideline prepared for each topic. How to obtain the experimental guideline will be announced during the experiment guidance.

Additional Reading

Vollhardt/Schore Organic Chemistry Structure and Function; K. P. C. Vollhardt, N. E. Schore
Biochemistry EIGHTH EDITION; J. M. Berg, J. L. Tymoczko, G.J. Gatto, Jr., L. Stryer

Grade Assessment

Evaluated by implementation of experiments and experimental reports

Credits will be awarded to those students who score 60 or more.

Grades are as follows:

A+:100-95, A:94-80, B:79-70, C:69-65, C-:64-60, F:59-0.

Notes

It is assumed that you have earned credits for Safety in Laboratory.

Contacting Faculty

Professors and teaching assistants will answer the questions.

Inorganic Chemistry III (2.0credits) (無機化学 3)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	SAMJESKE Gabor arwed Designated Professor

Course Purpose

Inorganic chemistry III is the final part of a three-semester course in inorganic chemistry consisting of parts I, II, and III. Aim of the three-semester course is to present principles and fundamentals of inorganic chemistry, to introduce chemical reactions and to show examples of the role of inorganic chemistry in the industry, environment and every day lives.

Prerequisite Subjects

Fundamentals of Chemistry I and II, Analytical Chemistry, Inorganic Chemistry I, Inorganic Chemistry II

Course Topics

The contents of Inorganic Chemistry III will cover the topics of the coordination chemistry of transition metals (d and f block elements), organometallic compounds of s,p,d-block elements and an introduction to catalysis. It is desirable to read a textbook or reference materials before a class

Textbook

Catherine E. Housecroft, Alan G. Sharpe; INORGANIC CHEMISTRY, 5TH EDITION; PEARSON - PRENTICE HALL (For those students who have attended my previous lectures of Inorganic Chemistry I and II and already have the previous edition textbook, it will not be necessary to acquire the new edition)

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Activity (homework, quizzes, attendance): 10% Intermediate and final exam: 90% (30% intermediate, 60% final exam, comprehensive) TOTAL 100% = 100 pts

Notes

Contacting Faculty

Either after the classes or during the office hours/by email (to be announced) E-mail: gsamjeske@chem.nagoya-u.ac.jp

Biophysics (2.0credits) (生物物理学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Spring Semester
Elective/Compulsory	Elective
Lecturer	TAMA Florence Muriel Professor

Course Purpose

To understand the basics of biophysics, in which biological phenomena are described in terms of physics language

Prerequisite Subjects

biophysics

Course Topics

The course will cover structure of biomolecules (proteins, nucleic acids, membranes) before introducing biophysical techniques (experimental and computational) to characterize function/dynamics/folding of these biomolecules. It is desirable to read a textbook or reference materials before a class

Textbook

There is no designated textbook, but lecture materials will be handed out.

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

The final grade will be based on a mid-term exam, student presentations, assignments and attendance. Class attendance is required. Absentee must give a valid reason. A student will be regarded as ABSENT if he/she is absent from lecture more than 3 times or he/she is absent without valid reason from the mid term exam and student presentation.

Notes

Contacting Faculty

By email: florence.tama@nagoya-u.jp

Organic Chemistry V (2.0credits) (有機化学 5)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Jiyoung SHIN Designated Professor

Course Purpose

The primary purpose of the course is to learn the spectroscopic analysis of organic molecules and the interpretation of the spectral data. The course begins with theoretical/fundamental knowledge on the chromatographic and spectroscopic techniques (GC, HPLC, NMR, UV, IR, Raman, Mass, and so on) and continues to assignments of organic molecular structures with Spectra-type problems. Furthermore, it covers problem-solving regarding organic reactions to reinforce students' understanding of the molecular structures/reactivities. The participants are expected to solve the progressive problems sequentially.

Prerequisite Subjects

Organic chemistries I-II

Course Topics

Class 1 & 2. Purification/Separation of Organic Molecules --- Chromatographic Principles and Methods; Gas Chromatography and Liquid Chromatography. Class 3. Principle of Mass Spectrometry --- Ionization Techniques (EI, CI, FAB, ESI, APCI); Ion Separation Techniques (Magnetic Sector, Quadrupole, Ion Trap, TOF, FT); Fragmentations (Heterolytic and Homolytic Cleavages); Mass Patterns of Isotopes. Class 4. Assignment of Mass Spectra --- Guidelines for predicting prominent EI Spectra peaks for Alcohols, Ethers, Ketones, Carboxylic Acids, Carboxylic Esters, Amines, and Aliphatic Sulfides. Class 5. Vibration Spectroscopy --- FT-IR Absorption Spectroscopy and Raman Spectroscopy; Rayleigh and Stokes/Antistokes lines; Molecular Vibrational Motions; Assignment of IR Spectra of Organic Molecules. Class 6. UV-Vis Absorption Spectroscopy --- Wavenumber & Wavelength; Map of UV/vis absorption spectrometer (Monochromator and Diode type); Beer-Lambert Law and Molecular Absorption Coefficient; Electron Transitions Involving p/s/n Electrons, Charge-Transfer Electrons, and d/f Electrons; π -Conjugated Systems; Absorption in the Gaseous States. Class 7. Emission Spectroscopy --- Jablonski Energy Diagram and Electron Spin States; Fluorescence and Phosphorescence; Stokes Shift; Instrumental Outlines; Lifetime Decay Profiles; Quantum Yield; Steady State & Transient Absorption Spectroscopy. Class 8 & 9. Fundamental Principle of NMR Spectroscopy --- NMR Active/Inactive Nuclei; External Magnetic Field, Larmor Frequency, Resonance Feature, Saturation, and Net Magnetization, 90 Degree Pulse, Spin-Spin Decay, FT of FID, Structure of NMR Machine, Chemical Shift, Shielding/Deshielding, J coupling; Karplus Curve for Vicinal Couplings and Cis/Trans Correlation; Shimming; Probe Tuning; Locking; Important Parameters for NMR Analysis. Class 10. Characterization of Molecular Structure and Assignment of NMR Spectra, and Advanced Techniques --- Peak Assignments of NMR Spectra of Example Organic Compounds (^1H , COSY, NOESY, ROESY, APT ^{13}C , HSQC, HMBC, TOCSY NMR Spectra); NMR Spectra of Paramagnetic Metal Complex. Class 11. Students' Presentation and Discussion (Assessment of the Classes 1-10). Class 12. Problem-Solving Process for Structure Determination and the Corresponding Organic Reaction. Class 13. Problem-Solving Process for Structure Determination and the Corresponding Organic Reaction. Class 14. Problem-Solving Process for Structure Determination and the Corresponding Organic Reaction. Class 15. Course Assessment and Solution Steps.

Textbook

- Organic Chemistry: Structure and Function (Seventh Edition), Peter C. Vollhardt and Neil E. Schore, (W. H. Freeman and Company), New York, 2014, Chapters 10-21. - Handout materials of the lectures will be given in the respective classes.

Additional Reading

1. Spectrometric Identification of Organic Compounds (8th Edition), Robert M. Silverstein, Francis X. Webster, David J. Kiemle, and David L. Bryce, (Wiley), 2012, ISBN-10:0470616377. 2. Spectroscopic Methods in Organic Chemistry (2nd Edition) Manfred Hesse, Herbert Meier, Bernd Zeeh (Translated by Richard Dunmur, Martin Myrray), Thieme, New York, ISBN 978-1-58890-488-1.

Grade Assessment

Examination (final: 40%) and Presentation (30%) as well as Assessment of Homework (30%): Credits will be awarded to those students who score 60 or more. Grades are as follows: S($x \geq 90$), A($90 > x \geq 80$), B($80 > x \geq 70$), C($70 > x \geq 60$), and F($60 > x$). This condition can be reconsidered following the pandemic condition.

Notes

Submission of "Course Withdrawal Request Form" is necessary to withdraw the course. The student needs to contact the course instructor when the student wants to withdraw from the course. In the cases of any unavoidable reasons such as sickness, accident, or no attendance school, the student may get a grade of 'Absent' through the judgment of the course instructor and the student when the student submits a 'Course Withdrawal Request Form' to receive the 'Absent' grade. No submission of sickness/absence reports and lack of attendance score will result in an 'F' grade: It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s). This assessment can be reconsidered within pandemic conditions where the attendance can be replaced with the submission of assignments.

Contacting Faculty

Communication through emails (instructor's e-mail: jyshin@chembio.nagoya-u.ac.jp and jyshin321@gmail.com) is available. Students are recommended to review the lectures by solving the related homework questions. Each assignment is due by the start of the next class if it is not specially announced.

Polymer Chemistry (2.0credits) (高分子化学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Faculty of Chemistry

Course Purpose

The purpose of this course is to learn basics of polymer science. The course begins with basic concepts of polymer, proceeds next to polymerization and synthesis of various polymers, and moves then to characterization, structures, properties, and functions of polymers, and biopolymers.

Upon taking this course, you aim to learn basics of polymer science, such as what polymers are, how to make polymers, how to characterize polymer properties, how properties are affected by polymer structures, how to design functional polymers, and how biopolymers are different from synthetic polymers. You will get basic knowledge on polymer science first and then abilities to apply the basic knowledge to creating new polymer materials.

Prerequisite Subjects

Fundamentals of Chemistry I, II, Organic Chemistry I, II, Physical Chemistry I, II, Analytical Chemistry

Course Topics

1. Introduction to Polymer
2. Step-Growth Polymerization
3. Free-Radical Addition Polymerization
4. Ionic Polymerization
5. Linear Copolymers and Other Architectures
6. Polymer Stereochemistry
7. Polymerization Reactions Initiated by Metal Catalysts and Transfer Reactions
8. Polymers in Solution
9. Polymer Characterization – Molar Masses
10. Polymer Characterization – Chain Dimensions, Structures, and Morphology
11. The Crystalline State and Partially Ordered Structures
12. The Glassy State and Glass Transition
13. Rheology and Mechanical Properties
14. The Elastomeric State
15. Structure-Property Relations
16. DNA and RNA that Encode Genetic Information as their Sequences
17. Higher-Order Structures of Polypeptides and Protein

Prior to taking each class, read the corresponding part of the textbook. After taking the class, solve the problems in the textbook by yourself. During each class, solve the quizzes.

Textbook

Polymers: Chemistry and Physics of Modern Materials (J. M. G. Cowie and Valeria Arrighi), 3rd Edition; CRC Press

Additional Reading

Principles of Polymerization (G. Odian), 4th Edition, Wiley-Interscience

Grade Assessment

The grading is based on quizzes during classes.

Credits will be awarded to those students who understand basics on synthetic and bio-based polymers, polymerization, polymer characterization, structures, properties, and functions. Advanced understandings will be considered.

A minimum average score of 60 or higher out of 100 should be obtained to pass this course.

Polymer Chemistry (2.0credits) (高分子化学)

Grades: S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

Notes

Contacting Faculty

Students can communicate with their lecturers after lectures.

Chemical Physics (2.0credits) (化学物理学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	YukoOKAMOTO Professor

Course Purpose

The purpose of this course is to learn about the statistical thermodynamics which can describe the behaviors of molecules in physical, chemical, and biological systems.

Prerequisite Subjects

Biophysics, Statistical Physics I

Course Topics

1. Mathematical Tools 2. Extremum Principles 3. Heat, Work, and Energy 4. Entropy and the Boltzmann Law 5. Thermodynamic Driving Forces 6. The Logic of Thermodynamics 7. Laboratory Conditions and Free Energy 8. Maxwell's Relations and Mixtures 9. The Boltzmann Distribution Law 10. The Statistical Mechanics of Simple Gases and Solids 11. Temperature and Heat Capacity 12. Chemical Equilibrium It is desirable to read a textbook or reference materials before a class

Textbook

K.A. Dill and S. Bromberg, "Molecular Driving Forces" 2nd ed. (Garland Science).

Additional Reading

F. Reif, "Fundamentals of Statistical and Thermal Physics" (McGraw-Hill).

Grade Assessment

Attendance: 10 %, Homework Sets: 20 %, Exams: 70 % The "Absent (W)" grade is given to those who did not take exams. The "Fail" grade is given to those who did very badly with respect to the above evaluation criteria: attendance, homework sets, and exams.

Notes

Contacting Faculty

Email: okamoto@tb.phys.nagoya-u.ac.jp

Course Type	Specialized Courses
Class Format	Exercise
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

The purpose of the course is to gain essential knowledge in the fields of inorganic and physical chemistry through exercises. Topics to be covered include physical chemistry and inorganic chemistry. Students are expected to focus on four separate topics.

Prerequisite Subjects

Chemical Thermodynamics, Quantum Chemistry, Reaction Kinetics, Basic Inorganic Chemistry, Complex Chemistry

Course Topics

Submission of the reports on assignments is required before the class.

- I. Basic Inorganic Chemistry, Complex Chemistry;
- II. Chemical Thermodynamics;
- III. Quantum Chemistry;
- IV. Reaction Kinetics

Textbook

Will be introduced in the class.

Additional Reading

Will be introduced in the class.

Grade Assessment

Grades will be based on homework assignments and a final examinations. Students are expected to actively participate in class discussions, and must obtain a score of 60 or higher to pass the course.

Notes

Contacting Faculty

If students have any questions, send e-mail to the following email address:

Ia: nakamura@chembio.nagoya-u.ac.jp;

Ib: e-yamamoto@imass.nagoya-u.ac.jp;

II: noro@chembio.nagoya-u.ac.jp;

III: k-fuji@chembio.nagoya-u.ac.jp;

IV: akira@chembio.nagoya-u.ac.jp;

Organic Chemistry IV (2.0credits) (有機化学 4)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Jiyoung SHIN Designated Professor

Course Purpose

The primary purpose of this course is to acquire a logical framework for understanding advanced organic chemistry. The course begins with condensation reactions of carbonyl and amine compounds and moves on to various reactions comprising migration steps. It also continues heterocyclic chemistry and organometallic chemistry, which are rapidly-expanding fields. Organometallic compounds that incorporate the carbon-metal bonds as powerful nucleophiles have been widely used for effective synthetic transformation. Replacement of the first metal by a new one can activate or control the chemical reactions' outcomes. Based on the knowledge, the participants are expected to conduct how to perceive appropriate answers to challenging problems in organic chemistry.

Prerequisite Subjects

Fundamental Chemistry I and II, Organic Chemistry I, II, and III

Course Topics

Class 1. The reaction of Carbonyl Compounds --- Formations, Condensations, Reaction of Conjugated Carbonyl Compounds; Protection of Acyl Group; Decarboxylation of beta-Carbonyl Carboxylic Acid. Class 2. Amines --- Preparations of Amines (by Subsequent Alkylation, Reduction of Nitrile, Reduction of Imine, Reduction of Azide, Hydrogenation of Amide, Hofmann Rearrangement, Mannich Reaction, Gabriel Phthalimide Synthesis). Class 3. Amines --- Reactions of Amines (Alkylation, Acylation, Hoffmann Elimination). Class 4. Six-Membered Aromatic Heterocycles (Pyridine, Pyridazine, Pyrimidine, Pyrazine, Pyridine Derivatives, and PCC) --- Electron Configuration and Reactivity of Pyridine; Preparation of Pyridine; Pyrylium ion & Pyrones; Tautomerization of Hydroxypyridine into pyridone; Preparation of Pyridone. Class 5. Preparation and Nucleophilic/Electrophilic Substitutions of Pyridine N-oxides; Reactivity of Pyridine N-Oxide and Pyridine with Electron Donating Groups in Electrophilic Substitutions. Class 6. Five membered Aromatic Heterocycles (Pyrrole, Pyrazole, Imidazole, and Triazole) --- Electron Configuration of Pyrrole and Reactivity for Electrophilic Substitution; Electrophilic Substitutions of pyrrole (Bromination, Acylation, Mannich Reaction, Nitration, Polymerization); Preparation of Pyrrole. Class 7. Five membered Aromatic Heterocycles --- Reaction of Pyrrole (Decarboxylation, Acid-Catalyzed Intermolecular Condensation, Porphyrin Synthesis); Reaction of Thiophene (Friedel Crafts Acylation of 2-Methyl Thiophene); Reaction of Furane (Bromination, Acetal Formation, Ring Opening). Class 8. Fused Heterocycles (Quinoline, Isoquinoline, and Indol) --- Substitution Trends of Quinoline and Isoquinoline (Electrophilic and Nucleophilic Reactions); Preparation of Quinoline; Substitution Trends of Indol; Preparation of Indol. Class 9. Assessment of Classes 1-8 (Problems and Solutions). Class 10. Ring Formation from pi-Conjugation - Electrocyclizations (Thermal & Photochemical Reactions); Cycloadditions (Diels-Alder Reactions); Sigmatropic Rearrangements (Cope Rearrangement, Claisen (General, Johnson-Claisen, Eschenmoser-Claisen, Ireland-Claisen) Rearrangements, Sulfoxide Formation Through [2,3] Sigmatropic Rearrangement). Class 11. Ring Expansion or Ring Shrinking Reactions --- Baeyer Villiger Oxidation; Beckmann Rearrangement; Tiffeneau-Demjanov Rearrangement; Favoskii Rearrangement; Wagner Meerwein Rearrangement. Class 12-13. Organotransition Metal Chemistry: Electronegativity Differences and Organometal Reactions; Pd-catalyzed Cross Couplings (Negishi, Kumada, Stille, Suzuki-Miyaura, Sonogashira, Hiyama, Mizoroki-Heck Cross Couplings). Class 14. Organotransition Metal Chemistry: Organometal Catalyzed Metathesis (Grubbs & Schrock's Catalysts and the Cyclic Metathesis); Ziegler-Natta Catalysis; Wilkinson Reduction. Class 15. Assessment of Overall Classes (Final Test and Solution Process).

Textbook

Organic Chemistry: Structure and Function (Seventh Edition), Peter C. Vollhardt and Neil E. Schore, (W. H. Freeman and Company), New York, 2014, Chapters 21, 23-26.

Additional Reading

1. Organic Chemistry (Second edition), Jonathan Clayden, Nick Greeves, and Stuart Warren, Oxford, 2012, Chapters 29-30, and 40. 2. Advanced Organic Chemistry (Part B: Reaction and Synthesis, Fifth Edition), Francis A. Carey, Richard J. Sundberg, Springer, 2007, Chapters 7-8.3. Organometallic Chemistry (Second Edition), Gary O. Spessard, Gary L. Miessler, Oxford, 2010.

Grade Assessment

Examination (total 70%: midterm (30%) and final (40%)), Assessment of Homework (30%): Credits will be awarded to those students who score 60 or more. Grades are as follows: S($x \geq 90$), A($90 > x \geq 80$), B($80 > x \geq 70$), C($70 > x \geq 60$), and F($60 > x$). The assessment methods will be reconsidered following a pandemic condition.

Notes

Submission of "Course Withdrawal Request Form is necessary to withdraw the course. The student needs to contact the course instructor when the student wants to withdraw from the course. In the cases of any unavoidable reasons such as sickness, accident, or no attendance school, the student may get a grade of 'Absent' through the judgment of the course instructor and the student when the student submits a 'Course Withdrawal Request Form' to receive the 'Absent' grade. No submission of sickness/absence reports and lack of attendance score will result in an 'F' grade: It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s). This assessment can be reconsidered within pandemic conditions where the attendance can be replaced with the submission of assignments.

Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or through the appointment. Communication through emails (instructor's e-mail: jyshin@chembio.nagoya-u.ac.jp and jyshin321@gmail.com) is also available. Students are recommended to review the lectures by solving the related homework questions. Each assignment is due by the start of the next class if it is not specially announced.

Chemistry of Inorganic Materials II (2.0credits) (無機材料化学 2)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	SAMJESKE Gabor arwed Designated Professor

Course Purpose

The purpose of this two semester course is to understand the chemical and physical properties of various inorganic materials, their functions, their analysis and their applications.

Prerequisite Subjects

Fundamentals of Chemistry I & II, Inorganic Chemistry I & II, Chemistry of Inorganic Materials I

Course Topics

Solid State Chemistry
Analysis
Electric properties
Magnetic properties
Optical properties

It is desirable to read a textbook or reference materials before a class

Textbook

Solid State Chemistry and its Applications (2nd Edition, Student Edition), Anthony R. West; Wiley 2014

Additional Reading

Instructions will be given as necessary in class

Grade Assessment

Activity (homework, quizzes, attendance): 10%

Presentation: 20%

Intermediate and final exam: 70% (20% intermediate, 50% final exam, comprehensive)

TOTAL 100% = 100 pts

Grades are final and calculated on the basis of the performances during class, the presentation and in the two exams only. There will be no possibility to improve a grade after the final exam. Students who miss the final exam due to a (documented) illness, injury or other unavoidable reasons can ask the instructor.

Notes

Contacting Faculty

EEither after the classes or during the office hours/by email (to be announced)

Computational Chemistry (2.0credits) (計算化学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	YANAI Takeshi Professor

Course Purpose

Computers and computing technologies are becoming increasingly important as a tool to facilitate complex work and expand ones' abilities for carrying out chemical studies. In this class, attendees will learn basics of programming for effectively using computer and write programs in Python language for numerical analysis, chemical calculations, etc.

Prerequisite Subjects

Quantum Chemistry I

Course Topics

1. Python programming Tutorial
2. Numpy Tutorial
3. Graph and plotting: Matplotlib
4. Quantum chemistry calculations
5. Potential energy curves
6. Geometry optimization
7. Plotting of molecular orbitals
8. Problem sets

It is desirable to read a textbook or reference materials before a class

Textbook

There is no designated textbook, but lecture materials will be handed out.

Additional Reading

Python tutorial: <https://docs.python.org/2/tutorial/>

Numpy quick tutorial: <https://docs.scipy.org/doc/numpy/user/quickstart.html>

Matplotlib quick tutorial: <https://matplotlib.org/tutorials/introductory/pyplot.html>

Hartree-Fock theory:

<http://vergil.chemistry.gatech.edu/courses/chem6485/pdf/Hartree-Fock-Intro.pdf>

Scikit-learn tutorials: <http://scikit-learn.org/stable/tutorial/index.html>

Grade Assessment

Attendance and report on programming

"Absent (W)": if 10% of 90min class is absent in class room.

"Fail (F)": if final report is not handed in.

Notes

Contacting Faculty

yanait@chem.nagoya-u.ac.jp

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Faculty of Chemistry

Course Purpose

The purpose of this course is to present an overview of cutting-edge organic chemistry, and learn important principles and facets of modern chemistry. The course includes sophisticated catalysts and reagents (organic-based and metal-based) for making useful compounds, designer functional organic molecules with various optoelectronic properties, and synthesis of natural products and biologically active complex molecules.

Prerequisite Subjects

Organic Chemistry 1-5

Course Topics

1. Organocatalysts for Green Chemistry
2. Chiral Catalysts for Enantioselective Synthesis
3. Transition Metal Catalysts for Unreactive Bond Activation
4. Synthesis of Optoelectronic Materials
5. Synthesis of Natural Products and Biologically Active Compounds

It is desirable to read a textbook or reference materials before a class

Textbook

The textbook is not specified.

Additional Reading

Organic Chemistry: Structure and Function 6th ed.
K. Peter C. Vollhardt, Neil E. Schore

Grade Assessment

Grades will be based on reports.

Notes

No requirements for attending this course.

Contacting Faculty

Students can communicate with their lecturers during lectures, office hours, or via email.
Contact: Prof. Kohsuke Ohmatsu <ohmatsu@chembio.nagoya-u.ac.jp>

Biochemistry IV (2.0credits) (生化学 4)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Tsukasa MATSUDA Professor

Course Purpose

This course is aimed at expanding students' knowledge in basics of the gene expression and replication from biochemical aspects, including metabolism, structure and molecular function of DNA, RNA and related proteins.

Prerequisite Subjects

Biochemistry I, II and III Basic knowledge of biology and chemistry Cell Biology I and II, Genetics I and II

Course Topics

Part V "Gene expression and replication" of the text book
1. DNA structure and interaction with proteins
2. DNA synthesis
3. DNA repair and recombination
4. RNA metabolism: transcription and posttranscriptional processing
5. Transfer RNA and ribosomes
6. Translation and posttranslational processing
7. Gene organization and regulation of gene expression
It is desirable to read a textbook or reference materials before a class

Textbook

Principles of Biochemistry International Student Version, Forth edition Voet D, Voet JG, Pratt CW (John Wiley & Sons)
The textbook (or E-Text) will be used every time in the class including a term exam.

Additional Reading

Molecular Biology of the Cell, Alberts B et al. (Taylor & Francis)

Grade Assessment

Evaluation will be based on examinations at the end of course, and answer/report sheets for Checkpoint at every time of the class.
Absent: based on submission of Course Withdrawal Request Form. Fail: based on failure in the examinations & the answer/report sheets

Notes

Contacting Faculty

Office: Bioagricultural Sciences Building A, Room A-528 Phone: 052-789-4129 E-mail: tmatsuda@agr.nagoya-u.ac.jp

Cell Biology IV (2.0credits) (細胞学 4)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Hideki SHIBATA Associate Professor

Course Purpose

This course covers advanced topics in molecular cell biology, including application and methods. Students will learn how research on molecular cell biology is achieved with advanced technology in the particular areas of cancer cells, ion transport, biomedicines, live cell imaging, etc.

Prerequisite Subjects

Cell Biology I, II, and III

Course Topics

(I) Ion channels: Electrophysiology, structure and function(II) Live cell imaging (III) Immunotherapy (IV) ExamIt is desirable to read a textbook or reference materials before a class

Textbook

I do not appoint the textbook

Additional Reading

Essential Cell Biology (4th ed.) Bruce Alberts et al. ; Molecular Biology of the Cell (6th ed.)

Grade Assessment

Evaluation will be based on in-class participation, assignments, and examinations. Absent – based on submission of Course Withdrawal Request Form; Fail – based on “Failed” results of examinations and assignments.

Notes

Contacting Faculty

Course Type	Specialized Courses
Class Format	Exercise
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

In order to utilize the knowledge, qualities and abilities to develop engineering, it is necessary to deepen the understanding of acquired knowledge. In this course, Solid State Chemistry, Structural Chemistry and Electrochemistry, and Quantum Chemistry II are set as backgrounds, and the purpose of this course is to cultivate skills applicable to engineering by solving exercises in these fields.

By the end of this course, students should be able to do the following:

1. Apply the following knowledge to specific problems.
 - Solid State Chemistry
 - Structural Chemistry and Electrochemistry
 - Quantum Chemistry II
2. Acquire the foundation of applied and comprehensive skills required for future professional research.

Prerequisite Subjects

Crystal Chemistry, Inorganic Synthetic Chemistry, Structural Chemistry, Electrochemistry, Quantum Chemistry

Course Topics

1. Solid State Chemistry
2. Structural Chemistry and Electrochemistry
3. Quantum Chemistry II
4. Term-end examination

Except for the term-end examination, students must complete the required assignments before every class.

Textbook

Textbooks are not specified, but the required documents describing the assignments will be distributed during the guidance.

Additional Reading

Textbooks describing the following subjects. Other instructions will be given as needed.

- Solid State Chemistry
- Structural Chemistry and Electrochemistry
- Quantum Chemistry II

Grade Assessment

Your overall grade in the course will be decided based on the following:

- Every assignment and attitude during lectures: 60%
- Term-end examination: 40%

The ability to solve the following problems and have a correct understanding of the basic concepts and terms in these fields will be the criteria for passing the course.

- Solid State Chemistry
- Structural Chemistry and Electrochemistry

- Quantum Chemistry II

Credits will be awarded to those students who score 60 or more out of 100 points. Grades are as follows:

Enrollees after 2020

A+: 100-95A: 94-80B: 79-70C: 69-65C-: 64-60F: 59-0

Enrollees before 2019

S: 100-90A: 89-80B: 79-70C: 69-60F: 59-0

Notes

Contacting Faculty

Professors and teaching assistants will answer the questions.

Course Type	Specialized Courses
Class Format	Exercise
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

The purpose of the course is to gain essential knowledge of organic chemistry through classroom discussions and reports. At the end of the course, participants are expected to acquire the foundation of applied and comprehensive skills required for future professional research

Prerequisite Subjects

Basic Chemistry 1,2, Organic Chemistry 1-3

Course Topics

1. Nomenclature of Organic Compounds and Stereochemistry
2. Structure and Reactivity: Acids and Bases, Polar and Nonpolar Molecules
3. Reactions of Alkanes and Cycloalkanes
4. Reactions of Haloalkanes: Nucleophilic Substitution
5. Elimination Reactions
6. Additions to Alkenes and Alkynes
7. Benzene and Aromaticity: Electrophilic Aromatic Substitution
8. Electrophilic Attack on Derivatives of Benzene: Substituents Control Regioselectivity

Textbook

Textbooks are not specified, but the required documents describing the assignments will be distributed during the guidance.

Additional Reading

Organic Chemistry: Structure and Function 6th ed.
K.Peter C. Vollhardt, Neil E. Schore

Grade Assessment

Grades will be evaluated based on participation, reports, and final examination.
Students must obtain a score of 60 or higher to pass the course.

Notes

Contacting Faculty

Professors and teaching assistants will answer your questions.

Course Type	Specialized Courses
Class Format	Exercise
Course Name	Chemistry
Starts 1	4 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

The purpose of the course is to gain essential knowledge of organic chemistry through classroom discussions and reports. At the end of the course, participants are expected to acquire the foundation of applied and comprehensive skills required for future professional research

Prerequisite Subjects

Organic Chemistry 1-5 and chemistry tutorial 3.

Course Topics

(Topics for students in Applied Chemistry Course)

1. Reactions of Alcohols and the Chemistry of Ethers
2. Aldehydes and Ketones: Additions to Carbonyl Group
3. Enols, Enolates, and the Aldol Condensation
4. Ester Enolates and the Claisen Condensation
5. Carboxylic Acids and Their Derivatives
6. Amines and Their Derivatives: Functional Groups Containing Nitrogen
7. Chemistry of Benzene Substituents: Alkylbenzenes, Phenols, and Anilines
8. Heterocycles: Heteroatoms in Cyclic Organic Compounds
9. Amino Acids, Peptides, Proteins, and Nucleic Acids: Nitrogen-Containing Polymers in Nature
10. Carbohydrates: Polyfunctional Compounds in Nature

Textbook

Textbooks are not specified, but the required documents describing the assignments will be distributed during the guidance.

Additional Reading

Organic Chemistry: Structure and Function 6th ed.

K.Peter C. Vollhardt, Neil E. Schore

Grade Assessment

Grades will be evaluated based on participation, reports, oral exam and/or final examination.

Credits will be awarded to those students who score 60 or more.

Notes

Contacting Faculty

Professors and teaching assistants will answer your questions.

Chemistry and Biotechnology Laboratory 3 (3.0credits) (化学生命工学実験 3)

Course Type	Specialized Courses
Class Format	Experiment
Course Name	Chemistry
Starts 1	4 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

This course enhances the development of the student's skill in carrying out organic chemistry and biotechnology experiments. It will help your graduation research in 4th grade (graduation thesis A and B). Through organic chemistry laboratory, you will learn advanced experimental protocols for the synthesis, separation, purification, and identification of organic molecules. Biotechnology laboratory aims to learn advanced experimental procedure.

Prerequisite Subjects

Elemental Chemistry I & II, Organic chemistry 1 ~ 5, Biochemistry 1, chemistry and biotechnology laboratory 2.

Course Topics

* Advanced organic chemistry

1-a. Asymmetric synthesis of phenylalanine using chiral phase transfer catalysts

1-b. Derivatization of citronellal

2-a. Cross-coupling reaction with Grignard reagents

2-b. Chemiluminescence with luminol

3. C-C bond formation with enolate anions

4. Lidocaine as a synthetic drug

5. Synthesis of benzene ring via [2+2+2] cycloisomerization of alkynes with ruthenium catalyst

* Advanced biotechnology

1. Elemental Experiments in Recombinant DNA Technology

2. Purification and Analysis of Protein

3a. Fluorescent DNA probe for detection of INDEL

3b. Microchip electrophoresis-based DNA analysis

4. Mammalian cell culture

Textbook

Use an experimental guideline prepared for each topic. How to obtain the experimental guideline will be announced during the experiment guidance.

Additional Reading

Vollhardt/Schore Organic Chemistry Structure and Function, 6th Ed.; K. P. C. Vollhardt, N. E. Schore
Biochemistry EIGHTH EDITION; J. M. Berg, J. L. Tymoczko, G.J. Gatto, Jr., L. Stryer

Grade Assessment

Grading will be decided based on approach to the experiment (positiveness, activeness), logical thinking / judgment for the results, experimental skills and reports. Credits will be awarded to those students who score 60 or more out of 100 points.

Notes

It is assumed that you have earned credits for Safety in Laboratory.

Contacting Faculty

Professors and teaching assistants will answer the questions.

Course Type	Specialized Courses
Class Format	Experiment
Course Name	Chemistry
Starts 1	4 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

In order to cultivate academic skills, qualities, and abilities to develop engineering, it is necessary to acquire various advanced experimental knowledge and operations. The aim of this experiment is to acquire advanced experimental knowledge and operations related to inorganic chemistry, physical chemistry, polymer synthesis chemistry, and polymer physical chemistry. It also enhances the development of the ability to organize and analyze data and create reports.

This experiment consists of two parts; Inorganic/Physical Chemistry Experiment and Polymer Chemistry Experiment. By the end of this experiment, students should be able to do the following:

< Inorganic and physical chemistry experiment >

1. Acquiring basic knowledge on firing process, structural analysis and physical property evaluation of ceramics.
2. Understanding the fabrication process of nanosheets based on solution chemistry and the analysis method of nanomaterials.
3. Acquiring basic knowledge of inorganic and complex chemistry and learning characterization techniques relating to complex.
4. Acquiring basic knowledge of inorganic and analytical chemistry through the synthesis and evaluation of hierarchical porous materials.
5. Acquiring basic knowledges to make an experimental plan, to interpret the results, and to explain the achievements through reports and oral presentations.
6. Understanding the electron energy structure of semiconductors/organic dyes and their photoresponsivity.
7. Understanding the basics of programming on Linux OS through computer experiments on proteins.

< Polymer chemistry experiment >

1. Acquire an understanding of synthesis, separation/purification, and characterization of polymer.
2. Acquire an understanding of the safety experimental operation
3. Acquire knowledge regarding preparation of polymer materials and evaluation method of polymer physical phenomena.
4. Design experimental plans, organize and analyze data, and discuss results.
5. Create a logical report.
6. Deepen the understanding of polymer synthesis chemistry and polymer physical chemistry.

Prerequisite Subjects

Chemistry and Biotechnology Laboratory 1 ~ 3, Safety in Laboratory, Elemental Chemistry I & II, Chemical Kinetics with Exercises, Thermodynamics 1 & 2 with Exercises, Structural Chemistry and Electrochemistry with Exercises, Quantum Chemistry 1 & 2 with Exercised, Inorganic Chemistry 1 & 2 with Exercises, Chemistry of Inorganic Reaction, Organic Chemistry 1 ~ 5 with Exercises, Fundamentals of Polymer Chemistry, Synthetic Polymer Chemistry

Course Topics

Advanced experiments on inorganic chemistry, physical chemistry, and polymer chemistry, are carried out, then results of the experiments are discussed and summarized in a report. Presentation is also carried out in inorganic and physical chemistry experiment. Individual experimental topics are as follows.

< Inorganic and physical chemistry experiment >

1. Synthesis and Analysis of Biomedical Ceramics
2. Synthesis and Characterization of Inorganic Nanosheets
3. Syntheses and Characterization of Porous Metal Complexes
4. Synthesis and Characterization of Hierarchically Porous Materials by Sol-gel Method
5. Catalytic Action in Hydrogen Peroxide Decomposition Reaction
6. Fabrication and Characterization of Dye-sensitized Solar Cell
7. Protein Computer Experiment Guidelines.

< Polymer chemistry experiment >

1. Preparation and Characterization of Thermoplastic Elastomers Correlation between the Long-Chain Molecular Structure and the Physical Properties
2. Radical Copolymerization, Living Radical Polymerization, and Interfacial Polycondensation As Representatives of Chain-Growth Polymerization, Living Polymerization, and Step-Growth Polymerization
3. Contact Angle Goniometry for Surface Tension Measurements of Solid Surfaces Zisman Plot and Surface Treatment Techniques
4. Synthesis of Luminescent Poly(p-phenylenevinylene)-Amylose Composites

Read the experimental guideline before each experiment. In addition, a report task is assigned for each experiment. After organizing, analyzing, and considering the experimental results, submit it as a report by the submission deadline.

Textbook

Use an experimental guideline prepared for each topic. How to obtain the experimental guideline will be announced during the experiment guidance.

Additional Reading

Other instructions will be given as needed.

Grade Assessment

Grading will be decided based on the approach to the experiment (positiveness, activeness), logical thinking / judgment for the results, experimental skills and reports. Credits will be awarded to those students who score 60 or more out of 100 points. By passing both experiments of Inorganic/Physical Chemistry Experiment and Polymer Chemistry Experiment, you can earn the credits for this experiment.

Grades are as follows:

Enrollees after 2020

100-95 : A+94-80 : A79-70 : B69-65 : C64-60 : C-59-0 : F

Enrollees before 2019

100-90 : S89-80 : A79-70 : B69-60 : C59-0 : F

Notes

It is assumed that you have earned credits for Safety in Laboratory.

Contacting Faculty

Professors and teaching assistants will answer the questions.

Advanced Chemistry Tutorial A (1.0credits) (特別演習 A)

Course Type	Specialized Courses
Class Format	Exercise
Course Name	Chemistry
Starts 1	4 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

In the tutorial lessons, we will perform the reading and discussions on the reference books (English) in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. We will feed application ability, a process of the study, and a way of thinking about the inventions.

Prerequisite Subjects

All classes on chemistry and biochemistry

Course Topics

Textbooks and papers will be suggested in each research group: Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, EcoNano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design

Textbook

Textbooks and papers will be suggested in each research group.

Additional Reading

Students will be suggested some references.

Grade Assessment

Depends on research groups. In general, oral examinations and/or reports for the basic knowledge on each research field.

Notes

Contacting Faculty

Ask to the corresponding Professors in each research group.

Advanced Chemistry Tutorial B (1.0credits) (特別演習 B)

Course Type	Specialized Courses
Class Format	Exercise
Course Name	Chemistry
Starts 1	4 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

In the tutorial lessons, we will perform the reading and discussions on the reference books (English) in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. We will feed application ability, a process of the study, and a way of thinking about the inventions.

Prerequisite Subjects

All classes on chemistry and biochemistry

Course Topics

Textbooks and papers will be suggested in each research group: Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, EcoNano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design

Textbook

Textbooks and papers will be suggested in each research group.

Additional Reading

Students will be suggested some references.

Grade Assessment

Grades will be based on research activities in the laboratory. Minimum requirement is 60/100.

Notes

Contacting Faculty

Ask to the corresponding Professors in each research group.

Graduation Research A (5.0credits) (卒業研究A)

Course Type	Specialized Courses
Class Format	Experiment and Exercise
Course Name	Chemistry
Starts 1	4 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

Through graduation research in each group, cultivate creativity and comprehensive ability as a researcher in the fields of chemistry and biochemistry.

Achievement target

1. Acquire basic knowledge including safe experimental methods in the fields of chemistry and biochemistry.
2. Understand how to conduct research using the knowledge of the courses, theoretical thinking, how to write dissertations, oral presentations, etc., and develop creativity and comprehensive ability as a researcher.

Prerequisite Subjects

Undergraduate specialized classes

Course Topics

Through graduation research in each group, cultivate creativity and comprehensive ability as a researcher in the fields of chemistry and biochemistry.

Achievement target

1. Acquire basic knowledge including safe experimental methods in the fields of chemistry and biochemistry.
2. Understand how to conduct research using the knowledge of the courses, theoretical thinking, how to write dissertations, oral presentations, etc., and develop creativity and comprehensive ability as a researcher.

Textbook

Will be designated by the supervisor in each group.

Additional Reading

Refer to the necessary books and papers according to your research theme.

Grade Assessment

Grading will be decided based on research approach, discussion in group, and achievement of graduation thesis.

Grades will be based on research activities in the laboratory. Minimum requirement is 60/100.

Notes

Contacting Faculty

Ask to the supervisors in each group.

Graduation Research B (5.0credits) (卒業研究 B)

Course Type	Specialized Courses
Class Format	Experiment and Exercise
Course Name	Chemistry
Starts 1	4 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Faculty of Chemistry

Course Purpose

Through graduation research in each group, cultivate creativity and comprehensive ability as a researcher in the fields of chemistry and biochemistry.

Achievement target

1. Acquire basic knowledge including safe experimental methods in the fields of chemistry and biochemistry.
2. Understand how to conduct research using the knowledge of the courses, theoretical thinking, how to write dissertations, oral presentations, etc., and develop creativity and comprehensive ability as a researcher.

Prerequisite Subjects

Undergraduate specialized classes

Course Topics

Through graduation research in each group, cultivate creativity and comprehensive ability as a researcher in the fields of chemistry and biochemistry.

Achievement target

1. Acquire basic knowledge including safe experimental methods in the fields of chemistry and biochemistry.
2. Understand how to conduct research using the knowledge of the courses, theoretical thinking, how to write dissertations, oral presentations, etc., and develop creativity and comprehensive ability as a researcher.

Textbook

Will be designated by the supervisor in each group.

Additional Reading

Refer to the necessary books and papers according to your research theme.

Grade Assessment

Grading will be decided based on research approach, discussion in group, and achievement of graduation thesis.

Grades will be based on research activities in the laboratory. Minimum requirement is 60/100.

Notes

Contacting Faculty

Ask to the supervisors in each group.

Outline of Engineering III (2.0credits) (工学概論第3)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	3 Autumn Semester	4 Autumn Semester	4 Autumn Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	Gang ZENG Lecturer	Emanuel LELEITO Lecturer	GRIB Dina Lecturer
	Kiyohisa NISHIYAMA Lecturer		

Course Purpose

This course introduces the history, the current state and future prospects of R&D (research and development) in various sectors related to the field of engineering in Japan. This class consists of “omnibus-style” lectures, all provided in English.

What you will get tips in this lecture for:

Communication across different engineering fields

Communication across language barriers (English/Japanese)

Search skills for locating professional topics and information

Presentation skills

Reports and presentations, which require students to independently search necessary information, will be assigned in the lectures. The students should note that these reports are used for evaluation.

Prerequisite Subjects

This lecture does not require any background subject. Fundamental knowledge will be clearly instructed.

Course Topics

1. Science, Technology and Innovations in Embedded Computing Systems (Gang ZENG)

- This lecture gives an overview of the embedded computing systems related technologies in Japan. In particular, the latest innovations on the low-energy and automotive applications will be introduced.

- The students are asked to participate in group discussion to share their ideas and thoughts about energy conservation and future automobiles.

2. The innovative factors of technologies in Japan (Kiyohisa NISHIYAMA)

- This lecture provides the participants with the concept of 40 innovation principles. Some Japanese technologies are broken down into the combination of the principles as examples.

- The students each are asked to analyse a technology of interest found in Japan. The students will be able to grab the concepts of any technological innovations after completing this lecture.

3. Science, Technology and Innovation for Disaster Risk Reduction (Emanuel LELEITO)

- This lecture gives students an overview of the Scientific and Technology Innovations that have contributed to Japan's leading role in Disaster Risk Reduction (DRR).

- DRR related discussions and presentation in class will help students exercise their creative thinking and problem solving skills.

4. Societal, Cultural and Economic Contexts of Engineering Practice in Japan (Dina GRIB)

- The last part of this course introduces you to the Science, Technology and Society studies (STS) field and provides a brief overview of how Japanese cultural, economic, societal and political tradition affects technological innovation and scientific research as well as how STI in turn affect Japanese culture, society and politics.

- The participants will be invited to conduct a mini case study using online materials, share their findings in

class and participate in group discussions.

Textbook

Lecture materials will be distributed during at each lecture.

Additional Reading

Lecture materials will be distributed during at each lecture.

Grade Assessment

Credits will be awarded to those students who score over 60 out of 100 based on the following evaluation criteria:

- 1) Reports (60%): Each lecturer will ask you to prepare and submit reports to valuate your understanding of the topics taught. The reports will be worth 60% of the total score.
- 2) Presentation (40%): You will be asked to do a final presentation based on one or a combination of the topics taught. The presentation will require that you to do independent online research to gather necessary information and present the topic in 3-5 minutes. Your understanding of the topic as well as the effectiveness of your presentation will be evaluated. The presentation is worth 40% of the total score.

Notes

None

Contacting Faculty

Questions are received during or after class time.

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	3 Autumn Semester	4 Autumn Semester	4 Autumn Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	Associated Faculty	Associated Faculty	Associated Faculty

Course Purpose

This course discusses the fundamentals of, and current topics in each field of the advanced electrical, electronic and information engineering, with an overview of the status of their researches and developments in Japan. Topics to be introduced are those related with energy, material and device, information and communication, multimedia and so on.

Students will be familiar with the most advanced technologies in the above subject matter.

Prerequisite Subjects

Physics, Electromagnetics, Mathematics

Course Topics

This course consists of two parts:

1. Six lectures in the classroom which will be given by faculty members.
2. Tours to three laboratories of companies and/or research organizations.

These six lectures are divided three pairs of lectures and each pair is on one of Electrical Engineering, Electronics, and Information and Communication Engineering. Each lecture covers from the fundamental to the cutting-edge topics of the research area of the faculty member responsible to it.

During three tours, students will visit laboratories on energy generation and novel materials.

Submission of a report after each lecture and tour is mandatory.

Textbook

Some books will be introduced in the lecture.

Additional Reading

Some books will be introduced in the lecture.

Grade Assessment

Submission of a report after each lecture and tour is mandatory. A knowledge of lectured advanced technologies in electrical, electronic and information engineering is evaluated by the reports. The final score is determined based on scores of these reports. Students must obtain a score of 60 or higher out of 100 to pass the course.

Notes

Although the time slots assigned to this course are 3rd period (13:00-14:30) and 4th period (14:45-16:15), the tours may take longer time and finish after 16:15.

Students must attend all lectures and join all tours. If there is a student who missed a tour without notice, it compromises the reputation of Nagoya university.

Contacting Faculty

Students are encouraged to ask questions during and after lectures.

Faculty members can also be contacted at their offices, as well as by phone or email.

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Chemistry	Automotive Engineering	Automotive Engineering
Starts 1	3 Autumn Semester	4 Autumn Semester	4 Autumn Semester
Elective/Compulsory	Elective	Elective	Elective
Lecturer	Associated Faculty	Associated Faculty	

Course Purpose

The objectives of this course are (1) to establish scenarios for certain social infrastructure projects, and thereby introduce relevant civil engineering theories and construction technology, as well as conduct site-visits; (2) to survey, through technical site visits, various aspects of urban and architectural studies, including building material experiments, energy conservation, and the recent development of regional disaster mitigation activities. After completing this course, students will be able to: 1. Understand civil engineering theories and construction technology 2. Understand urban and architectural studies.

Prerequisite Subjects

As the objective of this class is to understand fundamentals of civil engineering and architecture, no background class is assigned.

Course Topics

Lecture and Site-visit 1: Preservation of Historical Area
Lecture and Site-visit 2: Architecture and culture
Lecture and Site-visit 3: Nagoya University Disaster Mitigation Research Center
Lecture 4: Social infrastructure and civil engineering (1) Expressway Development in Japan
Lecture 5: Social infrastructure and civil engineering (2) Maintenance and Operation of Expressway
Site-visit 6: Maintenance and Operation of Expressway
Site-visit 7: Traffic Control Center of Expressway
Reports will be assigned in each lecture.

Textbook

Suggested in the class, if necessary.

Additional Reading

Suggested in the class, if necessary.

Grade Assessment

Students will be evaluated on written reports. To pass, students must understand the fundamentals of civil engineering theories and construction technology, and urban and architectural studies.

Notes

No condition is required.

Contacting Faculty

Questions are welcome. Please send your questions by e-mail. E-mail: nakamura@genv.nagoya-u.ac.jp (Dr. Nakamura), tobita@sharaku.nuac.nagoya-u.ac.jp (Dr. Tobita).