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

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Fundamental and Applied Physics	Automotive Engineering
	Automotive Engineering		
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester		
Elective/Compulsory	Elective	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 mathematicalknowledge. The course is mainly intended for students taking Calculus I.

●Prerequisite Subjects

Calculus I, registration code : 0064511.

●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/fall2018.html

●Textbook

●Additional Reading

●Grade Assessment

Your final grade will be determined by homework (50%) and quizzes (50%).The grading scale will be: S: 90-100, A: 80-89, B: 70-79, C: 60-69, F: 0-59.

●Notes

●Contacting Faculty

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

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

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Fundamental and Applied Physics	Automotive Engineering
	Automotive Engineering		
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester		
Elective/Compulsory	Elective	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 andother 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

1. Geometric setting : points and vectors in Rn, located vectors in Rn, scalar product in Rn, norm and scalar product in Rn, parametric representation of a line, planes and hyperplanes. 2. Matrices and linear equations: matrices, homogeneous linear equations, row operations and Gauss elimination, elementary matrices. 3. Vector spaces: abstract definition, linear combinations, convex sets, linear independence, dimension, the rank of a matrix. 4. Linear maps: general maps, linear maps, kernel and range of linear maps, rank and linear maps, matrix associated with a linear map, composition of linear maps, inverse of a linear map.

●Textbook

None

●Additional Reading

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

●Grade Assessment

The assessment of this course coincides with the assessment of the course Linear Algebra II.Any student who does not participate in the final exam will receive the grade “Absent”.

●Notes

●Contacting Faculty

Phone: 052-789-5612Office: A-331, Science building A.

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

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry	Fundamental and Applied Physics	Automotive Engineering
	Automotive Engineering		
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester		
Elective/Compulsory	Elective	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-basedmechanics. It offers exercises to cultivate the ability to analyze and solve problems, as well as presentation anddiscussion skills so as to participate effectively in discussions among peers and instructors, leading to mastering theconcepts introduced in the lecture course. Therefore students taking the lecture course are expected to register forthis 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 StudentVersion with WileyPLUS Set (John Wiley & Sons, 2010ISBN:9780470576083) [However, do not purchase it beforethe first class meeting where further details will be announced in class]

●Additional Reading

●Grade Assessment

GradingAttendance 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

Email : florence.tama@nagoya-u.jp

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

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

●Course Purpose

Course PurposeThis 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 CoursesCalculus I; Fundamentals of Physics I ; Fundamentals of Physics II

●Course Topics

Course ContentsSee syllabus for Fundamental Physics II.

●Textbook

Fundamentals of Physics Extended 9th Edition International Student Version with WileyPLUS Set (John Wiley & Sons, 2010ISBN:9780470576083)

●Additional Reading

●Grade Assessment

GradingWeekly 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

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

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

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

●Course Purpose

The aim of this tutorial is to deepen the understanding of calculus and to cultivate the ability to apply mathematical knowledge. The tutorial 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２ｂ)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry Automotive Engineering	Fundamental and Applied Physics	Automotive Engineering
Starts 1	1 Spring Semester 1 Spring Semester	1 Spring Semester	1 Spring Semester
Elective/Compulsory	Elective 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 II.

●Prerequisite Subjects

Linear Algebra II

●Course Topics

See Linear Algebra II.

●Textbook

Linear Algebra with Applications, fourth edition, Otto Bretscher, Edition: Pearson (can be borrowed from the Central Library)

●Additional Reading

●Grade Assessment

Explained during the first class

●Notes

●Contacting Faculty

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

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry Automotive Engineering	Fundamental and Applied Physics	Automotive Engineering
Starts 1	1 Spring Semester 1 Spring Semester	1 Spring Semester	1 Spring Semester
Elective/Compulsory	Elective Elective	Compulsory	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.

●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

●Textbook

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

●Additional Reading

●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 IIb (1.0credits) (物理学基礎演習２ｂ)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry Automotive Engineering	Fundamental and Applied Physics	Automotive Engineering
Starts 1	1 Spring Semester 1 Spring Semester	1 Spring Semester	1 Spring Semester
Elective/Compulsory	Elective Elective	Compulsory	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. Oscillations2. Introduction to Maxwell's Equations3. Waves4. Electromagnetic Waves5. Images 6. Interference & Diffraction

●Textbook

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

●Additional Reading

●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 widelyused wet chemical methods, combined with an overview of the instrumental techniques used in contemporarychemical analysis.

●Prerequisite Subjects

●Course Topics

Analytical Chemistry will cover the following topicsAcid - base equilibriaPrecipitation/gravimetryRedox equilibriaTitrationSpectrochemical methodsChromatography

●Textbook

No textbook

●Additional Reading

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

●Grade Assessment

Intermediate exam: 30%, final exam: 70%TOTAL 100% = 100 pts.Grades: "S" = 100 - 90% (more than 90 pts), "A" = 89 - 80% (89 - 80 pts), "B" = 79 - 70% (79 - 70pts), "C" = 69 - 60%(69 - 60 pts), "F" = 59 - 0% (fewer than 60 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 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 Designated Professor

●Course Purpose

The main purpose of this course is to acquire a logical framework for understanding fundamental organic chemistry. This framework emphasizes how the structures of organic molecules, as well as the electron density configurations, are related to patterns of chemical reactions. On the basis of the knowledge, how to solve practical problems is learned sequentially.

●Prerequisite Subjects

Fundamentals of Chemistry I and II

●Course Topics

1. Structure and Bonding in Organic Molecules: Hybridization
2. Structures of Organic Molecules and Their Stereochemistry
 - Alkanes and Cycloalkanes
 - Alkenes and Alkynes
 - Delocalized -System
3. Structures and Reactivity
 - Polar and Nonpolar Molecules
 - Formal Charge and Oxidation States
 - Acids and Bases versus Electrophiles and Nucleophiles
 - Chemical Reactions: Additions, Substitutions, and Eliminations
 - Chemical Kinetics: Transition State, Intermediate, Endothermic and Exothermic Processes, and Activation Energy
4. Aliphatic Nucleophilic Substitutions: SN1 and SN2
 - Chemical Kinetics: Stabilities of Reaction Intermediates (Carbocations: Hyperconjugation and Resonances)
 - Stereochemistry upon the Stable Reaction Intermediate
 - Unimolecular Nucleophilic Substitutions (SN1): Favor Substrates, Nucleophiles, Leaving Groups, and Solvents
 - Bimolecular Nucleophilic Substitutions (SN2); Favor Substrates, Nucleophiles, Leaving Groups, and Solvents
 - Comparison of SN1 and SN2
 - Competing Reactions of SN1: Rearrangement and Unimolecular Elimination (E1)
 - Competing Reaction of SN2: Bimolecular Elimination (E2)
 - Unimolecular Elimination of Conjugate Bases (E1CB)

●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

●Grade Assessment

Examination [total 70%: two midterms(20% for each) and one final (30%)], Attendance (10%), and Assignment of Homework (20%). Credits will be awarded to those students who score 60 or more.
Grades are as follows: S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.
- 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. Furthermore, no submission of sickness/absence reports and lack of attendance score will result in 'F' grade. It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s).

●Notes

●Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or through the appointment. Communication through an e-mail (instructor's e-mail: jyshin@apchem.nagoya-u.ac.jp) is also available.

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

Course Type	Basic Specialized Courses	
Class Format	Lecture	
Course Name	Chemistry	Fundamental and Applied Physics
Starts 1	2 Autumn Semester	2 Autumn Semester
Elective/Compulsory	Compulsory	Elective
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 course begins with perfect gas law, proceeds to thermodynamics, and finishes with
applications of thermodynamics to simple mixtures.

●Prerequisite Subjects

●Course Topics

1 The Properties of Gases 1 (Ch. 1)
2 The Properties of Gases 2 (Ch. 1)
3 The First Law 1 (Ch. 2)
4 The First Law 2 (Ch. 2)
5 Pre-exam Review & EXAM 1 (Chs. 1 & 2)
6 The Second and Third Laws 1 (Ch. 3)
7 The Second and Third Laws 2 (Ch. 3)
8 Physical Transformations of Pure Substances (Ch. 4)
9 Simple Mixtures 1 (Ch. 5)
10 Simple Mixtures 2 (Ch. 5)
11 Pre-exam Review & EXAM 2 (Chs. 3 5)
12 Chemical Equilibrium 1 (Ch. 6)
13 Chemical Equilibrium 2 (Ch. 6)
14 Pre-final Review
15 FINAL EXAM (Ch. 1 6)

●Textbook

P. Atkins and J. de Paula: Atkins’ Physical Chemistry, 10th Ed., Oxford University Press, 2014

●Additional Reading

●Grade Assessment

Two exams: 100 points each, final exam (comprehensive): 200, homework: 50. TOTAL: 450.
Grade "S": 100-90% (405 or more points), "A": 89-80% (404 - 360 pts), "B": 79-70% (359 - 315 pts), "C": 69-60% (314
- 270 pts), "F": 59-0% (fewer than 270 pts).
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.

●Notes

●Contacting Faculty

Phone: 789-2480
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	YOU Young-Jai Designated Professor

●Course Purpose

The purpose of this course is to introduce the biomolecules and their contributions to life.

●Prerequisite Subjects

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

●Course Topics

1. Introduction: What does chemistry do with biology?2. Thermodynamics3. Water: Physical & chemical properties of water.4. Amino Acids5. Proteins: 2D structures6. Proteins: 3D structures7. Proteins in action: Hemoglobin8. Tools to study protein functions9. Proteins in action: enzymes10. DNA, RNA and genome11. Tools to study genomes

●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 edition2. 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, assignments and examinations.Absent based on submission of Course Withdrawal Request Form.Fail based on “Failed” results of examinations and assignments.

●Notes

●Contacting Faculty

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

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

This course is expected to deepen students' knowledge in basic cell organization, and is the beginning of series ofcourses on Cell Biology.Cell Biology I course provides students with an overview of basic cell processes: basics of cell chemistry and genetics,and cell membrane function.

●Prerequisite Subjects

●Course Topics

1. Basic cell organization and basic chemistry of the cell;2. Protein structure and function;3. Basic genetics;4. Cell membrane structure and function.

●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.Absent based on submission of Course Withdrawal Request Form.Fail - a total accumulated score of less than 60%.

●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	Fundamental and Applied Physics
Starts 1	2 Autumn Semester	2 Autumn Semester
Elective/Compulsory	Elective	Compulsory
Lecturer	SHIGEMORI Masaki Designated Professor	

●Course Purpose

This is the first of two courses in analytical mechanics. Analytical mechanics abstracts from Newtonian machanicsand generalizes it to a beautiful and versatile framework that can be applied to various areas of physics, such asquantum mechanics, statistitical mechanics, and relativity. After a survey of elementary princples, we discuss thecore concepts of Lagrangian and Hamiltonian mechanics, with special emphasis on symmetry principles, followed bysome explicit examples.

●Prerequisite Subjects

Analytical Mechanics II, Quantum Mechanics I

●Course Topics

1. Survey of elementary principles2. Variational principles and Lagrangian mechanics3. Symmetries and conservation laws4. Hamiltonian mechanics5. Central force problem

●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; 3rdedition (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

Will be based on attendance, homework and exams (The details will be announced in class)

●Notes

●Contacting Faculty

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. This course introduces first order and second order ordinary differential equations and their solution methods. Students master analytical techniques for problems that arise in physics, engineering and chemistry. 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

Course Outline• 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

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 517Phone: 052-789-2307Email: 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	ABE Tomohiro Designated Assistant Professor

●Course Purpose

Course PurposeStudents 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

Course Contents• 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.

●Textbook

None

●Additional Reading

1. Boyce W., DiPrima R, Elementary Differential Equations, 9th or 10th Ed., Wiley.2. Strang, G., Introduction to Linear Algebra, 4th Edition, Chapter 6.3. Riley K.F., Hobson M.P., and Bence S. J., 2006, Mathematical Methods for Physics and Engineering, 3rd ed., Cambridge University Press.4. Boas M.L., 1983, Mathematical Methods in the Physical Sciences, John Wiley & Sons.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: 50%; Class performance: 50% Criteria for “Absent” & “Fail” GradesThe “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: ES Building, ES719Phone: 052-789-2859Email: tanabash@eken.phys.nagoya-u.ac.jp

Statistical Physics I (2.0credits) (統計物理学１)

Course Type	Basic Specialized Courses	
Class Format	Lecture	
Course Name	Chemistry	Fundamental and Applied Physics
Starts 1	2 Autumn Semester	2 Autumn Semester
Elective/Compulsory	Elective	Compulsory
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

●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.
Questoins 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 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

●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.

●Textbook

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

●Additional Reading

None

●Grade Assessment

Intermediate 30%, final exam: 70%TOTAL 100% = 100 pts.Grades: "S" = 100 - 90% (more than 90 pts), "A" = 89 - 80% (89 - 80 pts), "B" = 79 - 70% (79 - 70pts), "C" = 69 - 60% (69 - 60 pts), "F" = 59 - 0% (fewer than 60 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 Designated Professor

●Course Purpose

The main 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 -bonds. On the basis of the knowledge, we consecutively learn how to solve practical problems in organic chemistry.

●Prerequisite Subjects

Fundamental Chemistries I and II, Organic Chemistry I

●Course Topics

1. Reactions of Alkenes
 - Neucleophilic Characters of -Bond and Electrophilic Additions
 - Hydrogenation, Hydration, Hydrohalogenation, and Halogenation
 - Haloalcohol and Haloether Syntheses
 - Carbene Addition
 - Oxidation
 - Radical Addition
 - Polymer Synthesis
2. Reactions of Alkynes
 - Reduction and Electrophilic Additions
 - Radical Addition
 - Oxidation
 - Heck Reaction
3. Delocalized -Systems
 - Stability of Extended Conjugation and Benzene
 - Transformation of Conjugated Dienes: Diels Alder Cycloaddition
4. Reaction of Benzene
 - Aromatic and Antiaromatic Compounds
 - Electrophilic Aromatic Substitutions
 - Halogenation, Nitration, and Sulfonation
 - Friedel-Crafts Alkylation and Friedel-Crafts Acylation
5. Electrophilic Attack on Derivatives of Benzene
6. Nucleophilic Substitutions via Benzyne Intermediates

●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

●Grade Assessment

Examination [total 70%: two midterms(20% for each) and one final (30%)], Attendance (10%), and Assignment of Homework (20%): Credits will be awarded to those students who score 60 or more.
Grades are as follows: S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.
 - 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. Furthermore, no submission of sickness/absence reports and lack of attendance score will result in 'F' grade. It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s).

●Notes

●Contacting Faculty

Students can communicate with their course instructor face-to-face either in the class or in the appointment time. Communication through an e-mail (jyshin@apchem.nagoy-u.ac.jp) 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)

●Textbook

P. Atkins and J de Paula: Atkins’ Physical Chemistry, 9th Ed., Oxford University Press, 2009.0

●Additional Reading

●Grade Assessment

Grading
Two exams: 100 points each, final exam (comprehensive): 200, homework: 50. TOTAL: 450.
Grade "S": 100-90% (405 or more points), "A": 89-80% (404 - 360 pts), "B": 79-70% (359 - 315 pts), "C": 69-60% (314 - 270 pts), "F": 59-0% (fewer than 270 pts).
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	SHIGEMORI Masaki Designated 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

Course Contents
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)

●Textbook

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

●Additional Reading

●Grade Assessment

Two exams: 100 points each, final exam (comprehensive): 200, homework: 50. TOTAL: 450.
Grade "S": 100-90% (405 or more points), "A": 89-80% (404 - 360 pts), "B": 79-70% (359 - 315 pts), "C": 69-60% (314 - 270 pts), "F": 59-0% (fewer than 270 pts).
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 throughout the semester.

●Notes

●Contacting Faculty

Office: SA Building-318-1 (Science & Agriculture)
Phone: 789-2480
E-mail: 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

Course Purpose This course introduces students to the basic framework of the chemical reactions of life. Topics covered include the chemical and structural properties of carbohydrates and lipids; membrane structure, assembly, and transport; reaction kinetics and regulation of enzymes; hormones and signal transduction pathways.

●Prerequisite Subjects

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

●Course Topics

Course ContentsPART I: BIOMOLECULESA. Carbohydrates1. Monosaccharides, Disaccharides, & Polysaccharides2. GlycoproteinsB. Lipids & Bilayers3. Lipid Classification4. Lipid BilayersC. Membranes5. Membrane proteins6. Membrane structure and assemblyD. Membrane Transport7. Passive and Active transportPART II: ENZYMESE. Enzyme Action8. General properties and catalytic mechanism9. Lysozyme and serine proteasesF. Properties of Enzymes10. Reaction kinetics and enzyme inhibition11. Control of enzyme activityG. Signal transduction12. Hormones13. Receptor tyrosine kinases14. G protein15. Phosphoinositide pathway

●Textbook

Principles of Biochemistry (International Students Version, 2012) by Voet, D., Voet, J.G. and Pratt, C.W., Wiley and son, Inc. USA. ISBN: 78-11809244-6.

●Additional Reading

Will be introduced in class

●Grade Assessment

Grading Grading materials: Homework (10%); Attendance and participation (20%); Exams (70%). Grading scale: S=90-100%; A=80-89%; B=70-79%; C=60-69%; F=below 59%.With a written request sent to the instructor before/on May 7 via e-mail, you can cancel a course assignment without it appearing on your record.No “Absent” grade will be given in this course. Students who fail to attend 3 or more lectures will immediately get an “F (Fail)” grade.

●Notes

●Contacting Faculty

Office: Science & Agriculture Building, Room 333 (SA333)Phone: (052-789-) 2967E-mail: ymizukami@bio.nagoya-u.ac.jpOffice hours: Thursday, 2:00 pm – 4:00 pm, or by an appointment via e-mail

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

This course continues the Cell Biology series of courses with purpose to deepen students' knowledge in basic cellorganization and functions.Cell Biology II focuses on intracellular transport, and how cells communicate and respond to the environment.Furthermore, it will provide details on the essential concepts of how plant and animal cells generate energy.

●Prerequisite Subjects

Cell Biology I, Cell Biology III

●Course Topics

1.Intracellular Compartments and Transport;2.Cell Communication;3.How Cells Obtain Energy from Food;4.Energy Generation in Mitochondria and Chloroplasts.

●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.Absent: based on submission of Course Withdrawal Request Form.Fail: Total accumulated score of less than 60%.

●Notes

●Contacting Faculty

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

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

●Course Purpose

Course PurposeThis course offers a solid introduction to electrostatics and magnetostatics. It introduces fundamental mathematical methods required to solve problems in physics, engineering and applied mathematics. This course has dual 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.

●Textbook

Griffiths, D.L., 2012, Introduction to Electrodynamics, 4th ed., Prentice Hall. (It is essential that students read this book.)

●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 517Phone: 052-789-2307Email: 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 thethree-semester course is to present principles and fundamentals of inorganic chemistry and also to show examples ofthe role of inorganic chemistry in the industry, environment and every day lives.

●Prerequisite Subjects

Fundamentals of Chemistry I and IIRelated CoursesINORGANIC CHEMISTRY I

●Course Topics

●Textbook

Basic Inorganic Chemistry (Cotton, Wilkinson, Gaus), 3rd Edition; Wileyand Inorganic Chemistry (Catherine Housecroft, Alan G. Sharpe) 4th Edition; Pearson- Prentice Hall

●Additional Reading

None

●Grade Assessment

Intermediate 30%, final exam: 70%TOTAL 100% = 100 pts.Grades: "S" = 100 - 90% (more than 90 pts), "A" = 89 - 80% (89 - 80 pts), "B" = 79 - 70% (79 - 70pts), "C" = 69 - 60%(69 - 60 pts), "F" = 59 - 0% (fewer than 60 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

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 chemicalcompounds without using complicated mathematics. For this purpose, students will learn basic concepts of the grouptheory in the first half of this course. Students will learn various point groups, structures of character tables, andbasic 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-statestructures and the activation energy of chemical reactions. Finally, the students will learn symmetry rules thatdetermine the pathways of reactions.By taking this course, students will understand (1) symmetry elements and symmetry operations of various pointgroups; (2) methods of mathematical calculations using character tables; (3) method to draw molecular orbital byobtaining group orbitals; (4) analyses of normal mode vibrations of simple molecules by leaning the whole moleculemethod and internal coordinate method; (5) judgment if a given dipole transition is allowed or not; (6) determinationsof 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 theGreat Orthogonality Theorem.

●Prerequisite Subjects

●Course Topics

1. Symmetry elements / operations and point groups2. Structure of character tables, reducible and irreducible representations, and direct product3. Kugel Group and subgroup4. Application of Group Theory 1: group orbital and molecular orbital5. Application of Group Theory 2: analyses of normal mode vibrations and basic concepts of IR / Raman spectroscopy6. Application of Group Theory 3: judgments of electronic / IR / Raman transitions7. Application of Group Theory 4: Jahn-Teller Theorem and structures of compounds8. Application of Group Theory 5: Allowed and forbidden reactions; Adiabaticity ofconcerted processes; Symmetry Rules and Principle of Least Motion

●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 / phonePhone: 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 Designated Professor

●Course Purpose

The main purpose of the course is to acquire a logical framework for understanding fundamental organic chemistry. This framework can provide an influence on the reactions of the organic compounds having important functional groups, such as hydroxy, carbonyl, and amino groups and the reactions of their derivatives. On the basis of the knowledge, how to solve practical problems is learned sequentially.

●Prerequisite Subjects

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

●Course Topics

1. Alcohols and Esters
 - Names and Physical Properties
 - Preparation of Alcohols
 - Alcohol as Acids and Bases and Its Reactivity
 - Preparation of Ethers and Williamson Ether Synthesis
 - Reactions of Ethers
2. Aldehydes and Ketones
 - Names and Preparation
 - Reactivity of the Carbonyl Group
 - Acidity of Aldehyde and Ketones
 - Enolate Ions and Keto-Enol Equilibria
 - Nucleophilic Additions
 - Reduction
 - Wittig Reaction
 - Baeyer-Villiger Oxidation
 - Protection of Carbonyl Group
 - Aldol condensation and Michael Addition: Acid- and Base-Mediated 1,4-Additions
3. Reaction of Carboxylic Acid and Its Derivatives

●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

●Grade Assessment

Examination [total 70%: two midterms(20% for each) and one final (30%)], Attendance (10%), and Assignment of Homework (20%): Credits will be awarded to those students who score 60 or more.
Grades are as follows: S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

 - 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. Furthermore, no submission of sickness/absence reports and lack of attendance score will result in 'F' grade. It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s).

●Notes

●Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or through the appointment. Communication through an e-mail (instructor's e-mail: jyshin@apchem.nagoya-u.ac.jp) is also available.

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

●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)

●Textbook

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

●Additional Reading

●Grade Assessment

Two exams: 100 points each, final exam (comprehensive): 200, homework: 50. TOTAL: 450.Grade "S": 100-90% (405 or more points), "A": 89-80% (404 - 360 pts), "B": 79-70% (359 - 315 pts), "C": 69-60% (314- 270 pts), "F": 59-0% (fewer than 270 pts).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	Fundamental and Applied Physics
Starts 1	3 Autumn Semester	3 Autumn Semester
Elective/Compulsory	Elective	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 ourknowledge of the solar system and send back to Earth ever more detailed pictures of distant worlds. The course willreview the different means of space exploration and use abundant data acquired by past and ongoing missions toillustrate the characteristics of the planets. A recurrent topic throughout the course will be the fascinating question ofthe existence of extraterrestrial life and its detection. We will also discuss the future of space exploration.

●Prerequisite Subjects

●Course Topics

1. Introduction2. The Solar System3. Space Exploration4. The Earth-Moon System5. Mercury6. Venus7. Mars8. The asteroid belt9. Jupiter10. Saturn11. Uranus & Neptune12. Trans-Neptunian Objects

●Textbook

●Additional Reading

●Grade Assessment

Students 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%Two quizzes: 20% (10% each)Two short reports: 20% (10% each)Oral presentation: 20%Written essay: 40%A student will be given an “Absent” grade if he or she submits a Course Withdrawal Request Form by the end ofNovember. This deadline does not apply to students who drop the class part-way through for an exceptional reason(e.g. illness, accident). A “Fail” grade is given to students who obtain a final score of less than 60%.

●Notes

●Contacting Faculty

Phone: 052-789-3037 / E-mail: humblet.marc@f.mbox.nago ya-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

●Textbook

Ceramic Materials: Science and Engineering (2nd Edition), C. Barry, Carter, M. Grant Norton, Springer, 2013

●Additional Reading

●Grade Assessment

Participation in quizzes, presentation 45%, Final exam: 55%
TOTAL 100% = 100 pts.
Grades: "S" = 100 - 90% (more than 90 pts), "A" = 89 - 80% (89 - 80 pts), "B" = 79 - 70% (79 - 70pts), "C" = 69 - 60%
(69 - 60 pts), "F" = 59 - 0% (fewer than 60 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

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

Course Purpose
This course give a comprehensive account of the fundamental principles underlying different quantum chemical methods, ranging from classical to the sophisticated.

●Prerequisite Subjects

Quantum Chemistry I & II

●Course Topics

Course Contents
1 Force Field Methods (Ch. 2)
2 Born Oppenheimer Approximation and Electronic Structure Methods (Ch. 3)
3 Electron Correlation Methods: Configuration Interaction (Ch. 4)
4 Electron Correlation Methods: Multi-reference Methods (Ch. 4)
5 Pre-exam Review & EXAM 1 (Ch. 2-4)
6 Electron Correlation Methods: Perturbation and Coupled Cluster Theory (Ch. 4)
7 Basis Sets (Ch. 5)
8 Density Functional Theory (Ch. 6)
9 Semiempirical Methods and Density-Functional Tight-Binding (Ch. 3)
10 Pre-exam Review & EXAM 2 (Ch. 3-6)
12 Molecular Properties (Ch. 10, 11)
13 Transition State Theory and Direct Ab Initio Molecular Dynamics (Ch. 12)
14 Pre-final Review
15 FINAL EXAM (Ch. 1-12)

●Textbook

F. Jensen: Introduction to Computational Chemistry, 2nd Ed., Wiley, 2006

●Additional Reading

●Grade Assessment

Two exams: 100 points each, final exam (comprehensive): 200, homework: 50. TOTAL: 450.
Grade "S": 100-90% (405 or more points), "A": 89-80% (404 - 360 pts), "B": 79-70% (359 - 315 pts), "C": 69-60% (314 - 270 pts), "F": 59-0% (fewer than 270 pts).

●Notes

●Contacting Faculty

Office: SA Building-424 (Science & Agriculture)
Phone: 747-6397
E-mail: sirle@chem.nagoya-u.ac.jp

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

Course PurposeNever before have humans had 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. In particular 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

Related CoursesFundamentals of Earth Science I & II

●Course Topics

Course Contents1. Global biogeochemical cycles2. Paleoclimatology3. Recent global warming I: Mechanisms4. Recent global warming II: Prevention, mitigation and adaptation5. Geological resources I: energy from the Earth6. Geological resources II: useful rocks and minerals7. Growth with limited resources: problems and solutions.

●Textbook

None

●Additional Reading

None

●Grade Assessment

GradingStudents 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%Two quizzes: 30% (15% each)Oral presentation: 30%Written essays: 40%Criteria for “Absent” & “Fail” GradesA student will be given an “Absent” grade if he or she submits a Course Withdrawal Request by the end of May. This deadline does not apply to students who drop the class part-way through for an exceptional reason (e.g. illness, accident). A “Fail” grade is given to students who obtain a final score of less than 60%.

●Notes

●Contacting Faculty

Office: Graduate School of Environmental StudiesDepartment of Earth and Planetary Sciences E516 Phone: 789-3037E-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

This laboratory class aims to learn fundamental experimental procedures on analytical chemistry and physical chemistry.

●Prerequisite Subjects

Elemental Chemistry I & II, Analytical Chemistry 1 with Exercises, Physical Chemistry 1, Physical Chemistry 2, Chemistry of Inorganic MaterialsI, Quantum Chemistry

●Course Topics

1. Safety in chemical laboratory
2. Basic analytical Chemistry
3. Basic physical chemistry

●Textbook

Laboratory guide book (Dept. Ed.)

●Additional Reading

●Grade Assessment

Attendance record and experimental report

Credits will be awarded to those students who score 60 or more.
Grades are as follows:
S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

●Notes

●Contacting Faculty

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, Analytical Chemistry 1, Physical Chemistry 1, Physical Chemistry 2, Chemistry of Inorganic MaterialsI, Quantum Chemistry

●Course Topics

1. Safety in chemical laboratory
2. Basic organic chemistry
3. Basic Biotechnology

●Textbook

Laboratory guide book (Dept. Ed.)

●Additional Reading

Attendance record and experimental reports

Credits will be awarded to those students who score 60 or more.
Grades are as follows:
S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

●Grade Assessment

●Notes

●Contacting Faculty

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 third 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

Inorganic Chemistry I + II, Chemistry of Inorganic Materials I, Analytical Chemistry

●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.

●Textbook

Catherine E. Housecroft, Alan G. Sharpe; INORGANIC CHEMISTRY, 4TH EDITION; PEARSON - PRENTICE HALL

●Additional Reading

●Grade Assessment

Intermediate 30%, final exam: 70%TOTAL 100% = 100 pts.Grades: "S" = 100 - 90% (more than 90 pts), "A" = 89 - 80% (89 - 80 pts), "B" = 79 - 70% (79 - 70pts), "C" = 69 - 60% (69 - 60 pts), "F" = 59 - 0% (fewer than60 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

Introduction to Chemical and Biological Industries (2.0credits) (化学・生物産業概論)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Spring Semester
Elective/Compulsory	Elective
Lecturer	Part-time Faculty

●Course Purpose

The purpose of the course is to present a broad overview of trends in chemical and biological industries in Japan. Lectures will be given in English,and are open to both Japanese and international students.

●Prerequisite Subjects

N/A

●Course Topics

This course introduces cutting-edge R&D topics and anticipated future trends, and looks at chemical and biological production in Japan. It illustrates how these topics relate to society in general, how they play a role in energy and environmental issues, and how they affect the international community. The course will invite researchers with ample experience working abroad to give inspiring lectures in English.

●Textbook

N/A

●Additional Reading

N/A

●Grade Assessment

Grades will be based on reports.Credits will be awarded to those students who score 60 or more.Grades are as follows: S:100 - 90, A:89 - 80, B:79 - 70, C:69 - 60, F:59 - 0.

●Notes

●Contacting Faculty

Biophysics (2.0credits) (生物物理学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Chemistry	Fundamental and Applied Physics
Starts 1	2 Spring Semester	2 Spring Semester
Elective/Compulsory	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

Preferrably, Fundamentals of Physics I, II, III, and IV.

●Course Topics

Course Contents1. Brief history of biophysics 2. Biomolecules – amino acids and proteins3. Biomolecules – nucleic acids 4. Biomolecules – lipids and membranes5. Central dogma of molecular biology 6. Protein folding and salvation effects7. Asakura-Oosawa theory of depletion forces8. Protein unfolding (denaturation) at high temperature and by denaturants9. Cold denaturation of proteins 10. Protein unfolding at high pressure11. Computer simulations of protein folding and unfolding

●Textbook

●Additional Reading

●Grade Assessment

GradingEvaluation will be based on attendance and reports (take-home exams).Criteria for “Absent” & “Fail” GradesClass 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 final exam. A student who is NOT ABSENT but wishes to be considered as ABSENT must see the instructor immediately after the final exam.

●Notes

●Contacting Faculty

Office: Science Hall 5F 510, Phone: 052-789-3528Email: okamoto@phys.nagoya-u.ac.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 main 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 assign the structures of organic molecules within Spectra-type problems. Furthermore, the course also covers problem-solving in regard to organic reactions in an effort to reinforce students' understanding of the molecular structures/reactivities.

●Prerequisite Subjects

Organic chemistries I-II

●Course Topics

1. Separation and Purification of Organic Compounds
 - Chromatography, Recrystallization, and Distillation
 - GC and HPLC
2. Identification and Characterization of Organic Compounds
 - Mass Spectrometry
 - UV and Fluorescence Spectroscopy
 - IR and Raman Spectroscopy
 - NMR Spectroscopy (1H, 13C, DEPT, ATP, COSY, NOESY, HMQC, HMBC, and DOSY, and VT)
3. Problem-Solving for Structure Determination and the Corresponding Organic Reaction

●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

●Grade Assessment

Presentation (40%) and Examination (50%); Attendance and Assessment of Homework (10%): Credits will be awarded to those students who score 60 or more. Grades are as follows: S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

- 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. Furthermore, no submission of sickness/absence reports and lack of attendance score will result in 'F' grade. It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s).

●Notes

●Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or through the appointment. Contact by an e-mail is also available.

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 the basics of polymer science. The course begins with basic polymerconcepts, then proceeds to polymerization and synthesis of various structured polymers, and finishes withpolymer characterization and properties of polymers.

●Prerequisite Subjects

Organic Chemistry, Physical Chemistry, Analytical Chemistry

●Course Topics

1. Introduction to Polymer2. Step-Growth Polymerization3. Free-Radical Addition Polymerization4. Ionic Polymerization5. Linear Copolymers and Other Architectures6. Polymer Stereochemistry7. Polymerization Reactions Initiated by Metal Catalysts and Transfer Reactions8. Polymers in Solution9. Polymer Characterization – Molar Masses10. Polymer Characterization – Chain Dimensions, Structures, and Morphology11. The Crystalline State and Partially Ordered Structures12. The Glassy State and Glass Transition13. Rheology and Mechanical Properties14. The Elastomeric State15. Structure-Property Relations16. DNA and RNA that Encode Genetic Information as their Sequences17. Higher-Order Structures of Polypeptides and Protein

●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

Students must obtain a score of 60 or higher to pass the course. Grades: S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

●Notes

●Contacting Faculty

Chemical Physics (2.0credits) (化学物理学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Chemistry	Fundamental and Applied Physics
Starts 1	3 Autumn Semester	3 Autumn Semester
Elective/Compulsory	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 ofmolecules in physical, chemical, and biological systems.

●Prerequisite Subjects

Biophysics, Statistical Physics I

●Course Topics

1. Mathematical Tools2. Extremum Principles3. Heat, Work, and Energy4. Entropy and the Boltzmann Law5. Thermodynamic Driving Forces6. The Logic of Thermodynamics7. Laboratory Conditions and Free Energy8. Maxwell's Relations and Mixtures9. The Boltzmann Distribution Law10. The Statistical Mechanics of Simple Gases and Solids11. Temperature and Heat Capacity12. Chemical Equilibria

●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” grade is reserved for students who withdraw by the day that is specified by the University. After thatday, a letter grade will be awarded based on marks earned from all assessment during the semester.

●Notes

●Contacting Faculty

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

Chemistry/Biotechnology Tutorial I (0.5credits) (化学・生物工学演習１)

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. ChemicalThermodynamics; III. Quantum Chemistry; IV. Reaction Kinetics

●Textbook

See corresponding lectures.

●Additional Reading

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

●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: satsuma@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 main purpose of this course is to acquire a logical framework for understanding advance organic chemistry. The course begins with condensations of carbonyl and amine compounds and moves on the reactions comprising migration steps. Heterocyclic chemistry and organometallic chemistry are rapidly-expending fields, which we shell study. organometallic compounds incorporating the function of the carbon-metal bonds as powerful nucleophiles, such compounds have been widely used for effective synthetic transformation. Replacement of the first metal by new can activate or control the reactivity of the chemical reactions.

●Prerequisite Subjects

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

●Course Topics

1. Ester Enolates
 - Claisen, Retro-Claisen, and Aldol Condensations
 - Mannich Reactions
2. Amines and Their Derivatives
 - Preparation of Amines (from nitrile, azide, ketone, and carboxylic amides)
 - Reaction of Amines
3. Migrations (Rearrangements)
 - Cycloadditions
 - Sigmatropic Rearrangements
 - Electrocyclic Reactions
 - Ring Expansions
4. Heterocycles
 - Chemistries of Pyridine and Its Derivatives
 - Chemistries of Aromatic Heterocyclopentadienes
5. Organometallic Chemistry
 - Preparation of Organometal Reagents
 - Metal-Catalyzed Cross-Couplings, Carbonylative Cross-Couplings, and Aminations
 - Metal-Catalyzed Polymerizations and Reductions
 - Metal-Catalyzed Metatheses

●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

- Organic Chemistry (Second edition), Jonathan Clayden, Nick Greeves, and Stuart Warren, Oxford, 2012, Chapters 29-30, and 40.
- Advanced Organic Chemistry (Part B: Reaction and Synthesis, Fifth Edition), Francis A. Carey, Richard J. Sundberg, Springer, 2007, Chapters 7-8.
- Organometallic Chemistry (Second Edition), Gary O. Spessard, Gary L. Miessler, Oxford, 2010.

●Grade Assessment

Examination (one midterm and one final: 80%); Attendance and Assessment of Homework (20%): Credits will be awarded to those students who score 60 or more. Grades are as follows: S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

- 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. Furthermore, no submission of sickness/absence reports and lack of attendance score will result in 'F' grade. It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s).

●Notes

●Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or through the appointment. Communication through an e-mail (instructor's e-mail: jyshin@apchem.nagoya-u.ac.jp) is also available.

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

●Prerequisite Subjects

INORGANIC CHEMISTRY I + II +III
Chemistry of Inorganic Materials I
Analytical Chemistry

●Course Topics

Solid State Chemistry
analysis
electric properties
magnetic properties
optical properties
thermal properties

●Textbook

• Solid State Chemistry: An Introduction (4th Edition), Lesley E. Smart, Elaine A. Moore; CRC Press 2012
• Ceramic Materials: Science and Engineering (2nd Edition), C. Barry, Carter, M. Grant Norton, Springer, 2013

●Additional Reading

None

●Grade Assessment

Participation in quizzes, presentation 45%, Final exam: 55%
TOTAL 100% = 100 pts.
Grades: "S" = 100 - 90% (more than 90 pts), "A" = 89 - 80% (89 - 80 pts), "B" = 79 - 70% (79 - 70pts), "C" = 69 - 60% (69 - 60 pts), "F" = 59 - 0% (fewer than 60 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

Computational Chemistry (2.0credits) (計算化学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Chemistry	Fundamental and Applied Physics
Starts 1	3 Autumn Semester	3 Autumn Semester
Elective/Compulsory	Elective	Compulsory
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

●Course Topics

1. Introduction to Python programming
2. Basics of program
3. Algorithms
4. Numerical analysis methods
5. Practice
6. Presentation

●Textbook

●Additional Reading

https://docs.python.org/3/tutorial/

●Grade Assessment

Evaluation of attendance and programs prepared in this class.
Students may get ‘absent’ grades in the cases of any unavoidable reasons such as sickness, accident, and so on. In
the case of no attendance, students will get ‘failed’ grades.

●Notes

●Contacting Faculty

room:ITbM 302
ex:6397

Current Organic and Polymer Chemistry (2.0credits) (先端有機・高分子化学)

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

●Textbook

None

●Additional Reading

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

●Grade Assessment

Grades will be based on reports.
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 during lectures, office hours, or via email.

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

Course PurposeThis 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

Cell Biology I and II, Genetics I and IIPrerequisiteBiochemistry I, II and IIIBasic knowledge of biology and chemistry

●Course Topics

Course ContentsPart V "Gene expression and replication" of the text book1. DNA structure and interaction with proteins2. DNA synthesis3. DNA repair and recombination4. RNA metabolism: transcription and posttranscriptional processing5. Transfer RNA and ribosomes6. Translation and posttranslational processing7. Gene organization and regulation of gene expression

●Textbook

Principles of Biochemistry International Student Version, Forth editionVoet D, Voet JG, Pratt CW (Jphn Wiley & Sons)

●Additional Reading

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

●Grade Assessment

GradingEvaluation will be based on examinations at the end of course, and answer/report sheets for Checkpoint at every time of the class.Criteria for "Absent" & "Fail" GradesAbsent: 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-528Phone: 052-789-4129E-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	Masatoshi MAKI 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 post-transcriptional regulation, membrane traffic, ion transport, biomedicines, live cell imaging, etc.

●Prerequisite Subjects

Cell Biology I, II, and IIIPrerequisiteBasic knowledge on molecular biology

●Course Topics

Course Contents(1~4) Introduction of the course and cancer cell biology (by Maki)(5~8) Ion channels and their associated molecules in heart and muscles (by Maturana)(9~12) Biomedicines based on nanotechnology and biotechnology (by Kuroda)(13) Biology of epithelial cells and hepatocytology (by Oda)(14) Visualizing cells using fluorescence microscopy (by Shibata)(15) Exam

●Textbook

●Additional Reading

Essential Cell Biology (3rd ed.) Bruce Alberts et al. ; Molecular Biology of the Cell (5th 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

Laboratory of Molecular and Cellular Regulation, Department of Applied Molecular Biosciences, Graduate School of Bioagricutural Sciences, Room A-174. Phone: 052-789-4088 E-mail: mmaki@agr.nagoya-u.ac.jp

Chemistry/Biotechnology Tutorial II (0.5credits) (化学・生物工学演習２)

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 this course is to gain essential knowledge in the fields of inorganic and physical chemistry through lectures and exercises. Topics to be covered include physical chemistry and inorganic chemistry. In the two-semester sequence, students are expected to focus on four separate topics

●Prerequisite Subjects

Crystal Chemistry, Inorganic Synthetic Chemistry, Structural Chemistry, Electrochemistry

●Course Topics

1. Crystal Chemistry and Inorganic Synthetic Chemistry 2. Structural Chemistry 3. Electrochemistry4. Quantum Chemistry

●Textbook

See corresponding lectures

●Additional Reading

●Grade Assessment

Grades will be based on homework assignments and a final examination. Students are expected to actively participate in class discussions. Students must obtain a score of 60 or higher to pass the course. Grades: S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

●Notes

●Contacting Faculty

Questions will be addressed after each exercise. Office hours: Monday to Friday, 9:00 to 17:00, and by appointment.

Chemistry/Biotechnology Tutorial III (0.5credits) (化学・生物工学演習３)

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 seminar presentations, classroom discussions, and/or reports.

●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

None

●Additional Reading

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

●Grade Assessment

Grades will be evaluated based on attendance, reports, and final examination. Students must obtain a score of 60 or higher to pass the course. Grades:S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

●Notes

●Contacting Faculty

Professors and teaching assistants will answer your questions.

Chemistry/Biotechnology Tutorial IV (0.5credits) (化学・生物工学演習４)

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 or biotechnology through seminar presentations, classroom discussions, and/or reports.

●Prerequisite Subjects

Organic Chemistry 1-5.

●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(Topics for students in Biotechnology Course)1. Function and structural analysis of gene 2. Design of bioreactor3. Structural analysis and prediction of proteins4. Analysis and design of bioactive molecules5. Design of biopolymers

●Textbook

None

●Additional Reading

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

●Grade Assessment

Grades will be evaluated based on attendance, reports, oral exam and/or final examination.Credits will be awarded to those students who score 60 or more. Grades are as follows: S:100 - 90, A:89 - 80, B:79 - 70, C:69 - 60, F:59 - 0.

●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

To understand the concepts of the experiments, to learn the procedures of handling laboratory ware and equipment, to develop the capability of discussing the results obtained, and to train themselves how to write up a report. To learn the unique points in doing research in the field of inorganic, physical and organic polymer chemistry.

●Prerequisite Subjects

Basic Inorganic Chemistry, Complex Chemistry, Basic Physical Chemistry, Differential Equations, Chemical Kinetics, Electrochemistry, Quantum Chemistry, Structural Chemistry, and Organic Polymer Chemistry.

●Course Topics

In this class, student will take two courses; <Inorganic and Physical Chemistry> and <Organic Polymer Chemistry>.

<Inorganic and Physical Chemistry>
1. Fabrication and Characterization of Dye-sensitized Solar Cells
2. Catalytic Action in Hydrogen Peroxide Decomposition Reaction
3. Syntheses of Porous Metal Complexes, Characterization of Porous Metal Complexes
4. Protein Computer Experiment Guidelines
5. Synthesis and Analysis of Biomedical Ceramics
6. Synthesis and Characterization of Inorganic Nanosheets
7. Advanced Solid-State Chemistry

<Organic Polymer Chemistry>
1. Radical Copolymerization and Living Radical Polymerization
2. Synthesis of Poly(phenylene vinylene) in Helical Pores of Amylose
3. Preparation and Characterization of Thermoplastic Elastomer
4. Wettability of Polymer Film Surface by Contact Angle Measurement

●Textbook

A printed text will be provided for each topic.

●Additional Reading

●Grade Assessment

Attendance record and experimental reports

Credits will be awarded to those students who score 60 or more.
Grades are as follows:
S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

●Notes

●Contacting Faculty

Professors and teaching assistants will answer the questions.

Chemistry and Biotechnology Laboratory 4 (3.0credits) (化学生命工学実験４)

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 laboratory class aims to learn advanced experimental procedures on organic chemistry, polymer chemistry and biotechnology.

●Prerequisite Subjects

Elemental Chemistry I & II, Organic chemistry 1 ~ 5, Biochemistry 1

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

Attendance record and experimental reportCredits will be awarded to those students who score 60 or more.Grades are as follows: S:100-90, A:89-80, B:79-70, C:69-60, F:59-0.

●Notes

●Contacting Faculty

Advanced Chemisty 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
Tutorials in each research group

●Prerequisite Subjects
All required subjects

●Course Topics
Tutorials for the graduation research in each group

●Textbook

●Additional Reading

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

●Notes

●Contacting Faculty

Advanced Chemisty 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

Tutorials in each research group

●Prerequisite Subjects

All required subjects

●Course Topics

Tutorials for the graduation research in each group

●Textbook

●Additional Reading

●Grade Assessment

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

●Notes

●Contacting Faculty

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

In this course, students will develop an approach for their graduation thesis projects. The course comprises 1) objectives for the thesis projects, 2) experimental and analysis, and 3) presentations.

●Prerequisite Subjects

All required subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

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

●Notes

●Contacting Faculty

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

In this course, students will develop an approach for their graduation thesis project. The course comprises 1) objectives of the thesis projects, 2) experimental and analysis, and 3) presentations.

●Prerequisite Subjects

All required subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

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

●Notes

●Contacting Faculty

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	Fundamental and Applied Physics	Automotive Engineering
Starts 1	3 Autumn Semester 4 Autumn Semester	4 Autumn Semester	4 Autumn Semester
Elective/Compulsory	Elective Elective	Elective	Elective
Lecturer	Emanuel LELEITO Lecturer	Gang ZENG Lecturer	Kiyohisa NISHIYAMA Lecturer

●Course Purpose

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

●Prerequisite Subjects

Nothing

●Course Topics

1. Introduction to Embedded Computing Systems and Related Technology　1.1 Fundamentals and Trends　1.2 Low Energy Design　1.3 Automotive Applications2. Introduction to Disaster Management and Related Technology　2.1 Introduction to Disaster Management　2.2 Disaster Management Technology　2.3 Disaster Management Related Mini class project3. Introduction to Mass Production and Related Technology　3.1 Introduction to Mass Production　3.2 Technology for Mass Production　3.3 Current Problems and Future of Mass Production

●Textbook

The lecture materials will be distributed in each lecture.

●Additional Reading

1.“Programming Embedded Systems”, Second Edition, Michael Barr and Anthony Massa, O`Reilly Media 20062.“Designing Embedded Processors: A Low Power Perspective”, Henkel, Jeorg and Parameswaran, Sri, Springer Published 2007.3.“Disaster Management in Japan”, Cabinet Office, Government of Japan (Available Online)
http://www.bousai.go.jp/panf/saigaipanf.pdfhttp://www.bousai.go.jp/1info/pdf/saigaipanf.pdf4.“Disasters by Design: A Reassessment of Natural Hazards in the United States (Natural Hazards and Disasters: Reducing Loss and Building Sustainability in a Hazardous World: A Series)”, Dennis Mileti, A Joseph Henry Press.5.“Toyota Production System: Beyond Large-Scale Production”, Taiichi Ohno, Productivity Press 1988

●Grade Assessment

Attendance: 40%, One report per lecture: 30%, Final presentation: 30%

●Notes

●Contacting Faculty

Lecturer: Gang ZengEmail: sogo@ertl.jpTel: 052-789-5420

View of Advanced Electrical/ Electronic and Information Engineering (2.0credits) (電気電子情報先端工学概論)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Chemistry Automotive Engineering	Fundamental and Applied Physics	Automotive Engineering
Starts 1	3 Autumn Semester 4 Autumn Semester	4 Autumn Semester	4 Autumn Semester
Elective/Compulsory	Elective Elective	Elective	Elective
Lecturer	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. To familiarize students with the subject matter, trips to the related manufactuaring companies are planned

●Prerequisite Subjects

●Course Topics

1.Electrical Engineering 2.Electronic Engineering 3.Information and Communication Engineering

●Textbook

●Additional Reading

●Grade Assessment

reports

●Notes

●Contacting Faculty

Introduction to Civil Engineering and Architecture (2.0credits) (環境土木・建築学概論)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Chemistry	Fundamental and Applied Physics	Automotive Engineering
	Automotive Engineering		
Starts 1	3 Autumn Semester	4 Autumn Semester	4 Autumn Semester
	4 Autumn Semester		
Elective/Compulsory	Elective	Elective	Elective
	Elective		
Lecturer	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.

●Prerequisite Subjects

●Course Topics

Planned schedulesLecture & Site-visit 1: Architecture and culture – Nagoya Castle Hommaru Place Lecture & Site-visit 2: Architecture and culture – Nagakute Culture Center Lecture 1: Social infrastructure and civil engineering (1)Site-visit 3: Construction of new expressway (Central Nippon Expressway Co., Ltd)
Site-visit 4: Highway Traffic Control Center and Highway (Central Nippon Expressway Co., Ltd) Lecture and Site-visit 5: Nagoya University Disaster Mitigation & Management OfficeLecture 2: Social infrastructure and civil engineering (2)

●Textbook

●Additional Reading

●Grade Assessment

Students will be evaluated on attendance and written reports.

●Notes

●Contacting Faculty

Contact to Kentaro NAKAIEmail nakai@civil.nagoya-u.jp

Introduction to Physical Science and Engineering (2.0credits) (物理工学概論)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Chemistry	Fundamental and Applied Physics	Automotive Engineering
	Automotive Engineering		
Starts 1	4 Spring Semester	3 Spring Semester	4 Spring Semester
	4 Spring Semester		
Elective/Compulsory	Elective	Elective	Elective
	Elective		
Lecturer	Associated Faculty		

●Course Purpose

Fundamentals in applied physics, material science, and quantum energy are introduced. Magnetism and superconductivity, and recent topics of quantum computers are discussed. Materials sciences to resolve many problems in design of physical properties, in refining and formation processing of materials are discussed. Recent developments in materials science are introduced. Introduction to nuclear fusion and quantum energy utilization are also discussed.

●Prerequisite Subjects

●Course Topics

1. Introduction to magnetism 2. Introduction to quantum computers 3. Introduction to superconductivity 4. Introduction to laser materials processing I 5. Introduction to laser materials processing II 6. Introduction to nuclear fusion I 7. Introduction to nuclear fusion II 8. Introduction to nuclear fusion III 9. Introduction to nuclear fusion IV10. Fundamentals of ceramics and applications I11. Fundamentals of ceramics and applications II12. Fundamentals of ceramics and applications III13. Fundamentals of metals and applications I14. Fundamentals of metals and applications II

●Textbook

Lecture materials will be given during every lecture.

●Additional Reading

Shackelford, James F., Introduction to Materials Science for Engineers, Prentice Hall, Upper Saddle River, New Jersey, USA

●Grade Assessment

Evaluation will be based on written reports to be submitted at each lecture.

●Notes

●Contacting Faculty