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

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry Automotive Engineering	Fundamental and Applied Physics	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 Associate Professor	DEMONET Laurent Domi Designated Associate Professor	

●Course Purpose

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

●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.

●Textbook

●Additional Reading

●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 Ib(1.0credits)(数学演習１ｂ)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Chemistry Automotive Engineering	Fundamental and Applied Physics	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 Associate Professor	DEMONET Laurent Domi Designated Associate Professor	

●Course Purpose

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

●Prerequisite Subjects

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

Linear Algebra with Applications, fourth edition, Otto Bretscher, Edition: Pearson (not to buy: to borrow in Central Library)

●Additional Reading

●Grade Assessment

Explained during the first class

●Notes

●Contacting Faculty

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 Automotive Engineering	Fundamental and Applied Physics	Automotive Engineering
Starts 1	1 Autumn Semester 1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
Elective/Compulsory	Elective Elective	Elective	Elective
Lecturer	Foong See KIT Designated Professor	Tsutomu KOUYAMA Professor	

●Course Purpose

This is a companion course to the lecture course Fundamentals of Physics I, and offers exercises to cultivate the ability to analyze and solve problems, as well as presentation and discussion skills so as to participate effectively in discussions among peers and instructors, leading to mastering the concepts introduced in the lecture.

●Prerequisite Subjects

Related CoursesCalculus I; Fundamental Physics I ; Fundamentals of Physics II

●Course Topics

See syllabus for Fundamentals of Physics I

●Textbook

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

●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

FOONG See KitOffice: ES420 Phone: 052-789-2861 Email: skfoong@eken.phys.nagoya-u.ac.jpKOUYAMA TsutomuOffice: Science Hall 7F 723Phone: 052-789-5108Email:kouyama@bio.phys.nagoya-u.ac.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 Automotive Engineering	Fundamental and Applied Physics	Automotive Engineering
Starts 1	1 Autumn Semester 1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
Elective/Compulsory	Elective Elective	Elective	Elective
Lecturer	John A. WOJDYLO Designated Associate Professor	Bernard GELLOZ Designated 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, 2010 ISBN: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 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	RICHARD Serge Charles Designated Associate Professor	HERBIG Anne-Katrin Designated Associate Professor	

●Course Purpose

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

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	RICHARD Serge Charles Designated Associate Professor	HERBIG Anne-Katrin Designated Associate Professor	

●Course Purpose

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Fundamental Physics Tutorial II a (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	Bernard GELLOZ 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	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	Compulsory	Elective
	Elective		
Lecturer	Bernard GELLOZ Designated 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	Berthold FISCHER Designated Professor

●Course Purpose

The purpose of this course is to teach students the fundamentals of analytical chemistry, in preparation of further studies. The course focuses mainly on classical but still widely used wet chemical methods, combined with an overview of the instrumental techniques used in contemporary chemical analysis.

●Prerequisite Subjects

Fundamentals of Chemistry I and IILaboratory in Chemistry

●Course Topics

1. General Concept of Chemical Equilibrium 2. Acid-Base Equilibria 3. Acid-Base Titrations 4. Complexometric Reactions and Titrations 5. Gravimetric Analysis and Precipitation Equilibria 6. Precipitation Reactions and Titrations 7. Redox Reactions and Equilibria 8. Spectrochemical Methods 9. Sample Preparation: Solvent and Solid-Phase Extraction 10. Chromatography: Principles and Theory 11. Gas Chromatography 12. Liquid Chromatography 13. Clinical Chemistry 14. Environmental Sampling and Analysis

●Textbook

No textbook

●Additional Reading

None

●Grade Assessment

Participation in discussion, Quizzes, Group presentations, homework: 50 % Final Exam 50 % TOTAL: 100 % Grade "S": 100-90% (90 or more points), "A": 89-80% (89 - 80 pts), "B": 79-70% (79-70 pts), "C": 69-60% (69-60 pts), "F": 59-0% (fewer than 59 pts).

●Notes

●Contacting Faculty

There are two ways to communicate with the instructor: face-to-face in the lecture or the office hour and by e-mail.789-5041 fischer@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 Associate Professor

●Course Purpose

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 are related to the molecular functions in chemical reactions. On the basis of the knowledge, we consecutively learn how to solve practical problems in organic chemistry.

●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 π-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 (Sixth Edition), Peter Vollhardt and Neil Schore, (International Edition: W. H. Freeman and Company), New York, 2009, Chapters 1-7.

●Additional Reading

●Grade Assessment

Examination (two midterms and one final: 70%); Attendance (10%: each absence deducts 3 point); Assessment of Homework (20%): S($x \geqq 90$), A($90 > x \geqq 80$), B($80 > x \geqq 70$), C($70 > x \geqq 60$),

and F(60>x).

●Notes

●Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or in 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

Fundamentals of Chemistry I and II

●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.

It is essential to sit in each exam during the scheduled class time. There will be NO make-up exam. In the event of a missed exam due to a serious illness, accident or family emergency, compelling written documentation of the reason for the absence will be required. If the reason is accepted, the final grade will be calculated from the appropriately weighted average from the rest of the exams. If the reason will be deemed insufficient, the absence will be unexcused, and zero points will be awarded for the missed exam.

●Notes

●Contacting Faculty

Office: SA Building-318-1 (Science & Agriculture)
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	Yukiko MIZUKAMI Designated Professor

●Course Purpose

Course Purpose This course provides students with a comprehensive introduction to the chemical evolution of biomolecules and their contributions to life. Topics discussed include the origin of life; chemical and physical properties of water; chemical, structural, and functional properties of nucleotides, nucleic acids, amino acids, and proteins.

●Prerequisite Subjects

Fundamentals of Biology I & II (Terms I & II, respectively)Biochemistry II, III, and IV (Terms IV, V, and VI, respectively)

●Course Topics

Course ContentsPART I: INTRODUCTION1. Life, Cells and Thermodynamics (1): The origin of Life.2. Life, Cells and Thermodynamics (2): Cellular architecture; Thermodynamics.3. Water: Physical & chemical properties of water.Part II: BIOMOLECULES4. DNA Structure, Function, and Engineering (1): Nucleotides; Nucleic acid structure and function.5. DNA Structure, Function, and Engineering (2): Nucleic acid sequencing; Manipulating DNA.6. Amino Acids: Amino acid structure; Stereochemistry; Amino acid derivatives.7. Proteins: Primary structure (1): Polypeptide diversity; Protein purification and analysis. 8. Proteins: Primary structure (2): Polypeptide sequencing; Protein evolution.9. Proteins: 3D structure (1): Secondary and tertiary structures; Quaternary structure and symmetry.10. Proteins: 3D structure (2): Protein stability; Protein folding.11. Physical Activities of Proteins (1): Myoglobin and hemoglobin; Actin and myosin.12. Physical Activities of Proteins (2): Antibodies.

●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%.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 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	Elective
Lecturer	Maria VASSILEVA Designated Associate Professor

●Course Purpose

Course Purpose This course is expected to refresh and deepen students' knowledge in basic cell organization, and is the beginning of a series of courses on Cell Biology that will stretch over two-year period. The first part, Cell Biology 1, is concentrating on cell membrane structure and function as well as basic genetic mechanisms. Students are expected to become adept at using appropriate scientific terminology, explain the basic cell biology concepts and be able to analytically manipulate the information presented to solve scientific problems.

●Prerequisite Subjects

Successfully completed Fundamentals of Biology 1Genetics I

●Course Topics

Course Content1. Introduction to cells1.1 Cell architecture1.2 Chemical components of cells1.3 Protein structure and function2. Cell membrane: Structure and Function2.1 Membrane structure 2.2 Membrane transport3. DNA and chromosome: Basic genetic mechanisms3.1 DNA replication, repair and recombination3.2 DNA translation3.3 Control of gene expression

●Textbook

Essential Cell Biology (third edition), B. Alberts et al., Garland Science.

●Additional Reading

Becker`s world of the cell (8 ed.), Hardin, Bertoni, Kleinsmith, Pearson Molecular Biology of the Cell, B. Alberts et al., Taylor & Francis.

●Grade Assessment

GradingEvaluation will be based on in-class participation, assignments and examinations.While presence will not be marked, students are encouraged not to miss classes, as in-class participation will be considered an important element in overall grading.Absent – based on submission of Course Withdrawal Request Form.Fail – based on "Failed" results of examinations and assignments.

●Notes

●Contacting Faculty

School of Science, Division of Biological SciencesE building, room E202Phone: 052-789-3530E-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	Compulsory	Compulsory
Lecturer	Foong See KIT Designated Professor	

●Course Purpose

Course PurposeThis is the first of two Year II courses in analytical mechanics. Its purpose is to gain a deeper understanding of Newtonian mechanics treated in Year I, and to introduce the Lagrangian and Hamiltonian formulations of mechanics. These formulations are then used in the solution of the two-body central force problems. Comparisons will be made between the approaches.

●Prerequisite Subjects

Calculus I, Calculus II, Fundamentals of Physics I &IIRelated CoursesPhysics Tutorial Ia, Mathematical Physics I & II, Analytical Mechanics II, Quantum Mechanics I &II

●Course Topics

Course Contents1. Newton's Laws of Motion 2. Momentum and Angular Momentum 3. Energy and Forces 4. Calculus of Variations 5. Lagrange's Equations6. Hamiltonian Mechanics7. Two Body Central-Force Problems

●Textbook

John R. Taylor, Classical Mechanics (University Science Book, 2005)

●Additional Reading

These reference books are available in the Main Library1. R. D. Gregory: Classical Mechanics (Cambridge, 2008)2. J.B. Marion: Classical Dynamics of Particles and Systems (Academic Press, 1965) 3. G. R. Fowles: Analytical Mechanics (1962) 4. H. Goldstein, Poole & Safko, Classical Mechanics (Addison Wesley, 2002)

●Grade Assessment

GradingClass Attendance & Participation: 10%, Assignment: 20%, Tests: 30%, Final Exam: 40% Class attendance is required. Absentee must give a valid reason, supported with document. A student will receive an "Absent" grade if he is absent from lecture more than 3 times or he is absent without valid reason from the mid-term exam or final exam.

●Notes

●Contacting Faculty

Office: ES420 Phone: 052-789-2861 Email: skfoong@eken.phys.nagoya-u.ac.jp

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 Associate 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	Shinya MATSUZAKI 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	Fujio TAKIMOTO Designated Professor	

●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

●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: takimotof@nuem.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	Elective
Lecturer	Berthold FISCHER Designated Professor

●Course Purpose

The purpose of the course is to present the fundamental concepts and chemical principles of inorganic chemistry. This course is the first part of a three-semester sequence in inorganic chemistry, and deals with the basic principles including electronic structures, orbital, chemical bonds, and acids/bases.

●Prerequisite Subjects

Fundamentals of Chemistry I and II

●Course Topics

1. The Electronic Structure of Atoms2. Structure and Bonding in Molecules3. Ionic Solids4. The Chemistry of Selected Anions5. Introduction to Coordination Chemistry6. Solvents, Solutions, Acids, and Bases7. The Periodic Table and the Chemistry of the Elements

●Textbook

Inorganic Chemistry (Catherine Housecroft, Alan G. Sharpe) 4th Edition; Pearson-Prentice Hall

●Additional Reading

None

●Grade Assessment

Participation in discussion, Quizzes, Group presentations, homework: 50 %Final Exam 50 %TOTAL: 100 %Grade "S": 100-90% (90 or more points), "A": 89-80% (89 - 80 pts), "B": 79-70% (79-70 pts), "C": 69-60% (69-60 pts), "F": 59-0% (fewer than 59 pts). Nagoya University approved system; students can withdraw from this course if they submit the request form to the instructor by the officially published date.

●Notes

●Contacting Faculty

Office: SA Building-318-2 (Science & Agriculture) Phone: 789-5041
Email:fischer@chem.nagoya-u.ac.jpThere are two ways to communicate with the instructor: face-to-face in the lecture or the office hour and by e-mail.

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	Elective
Lecturer	Jiyoung SHIN Designated Associate Professor

●Course Purpose

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

●Prerequisite Subjects

Fundamental Chemistry I and II, Organic Chemistry I

●Course Topics

1. Reactions of Alkenes
- Neucleophilic Characters of π-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 π-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 (Sixth Edition), Peter Vollhardt and Neil Schore, (International Edition: W. H. Freeman and Company), New York, 2009, Chapters 11-16 and 22

●Additional Reading

●Grade Assessment

Examination (two midterms and one final: 70%); Attendance (10%: each absence deducts 3 point); Assessment of Homework (20%): S (100-90), A (90-80), B (80-70), C (70-60), and F (below 60)

●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.nagoya-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	Peter BUTKO 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	Yukiko MIZUKAMI 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 Spring Semester
Elective/Compulsory	Elective
Lecturer	Joyce A. CARTAGENA Designated Associate Professor

●Course Purpose

Course PurposeThis course will provide the essential concepts on how plant and animal cells generate energy in order to carry out biological processes and sustain life. Furthermore, the mechanisms of intracellular transport and how cells respond to the environment will be discussed in detail.

●Prerequisite Subjects

PrerequisiteCell Biology I or its equivalent

●Course Topics

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

●Textbook

Essential Cell Biology, Fourth EditionB. Alberts et al., Garland Science, 2013

●Additional Reading

1. Becker's World of the Cell, Eighth EditionJ. Hardin et al., Pearson, 20122. Molecular Biology of the Cell, Fifth EditionB. Alberts et al., Taylor and Francis, 20073. Cell Signaling: Principles and MechanismsW. Lim et al., Garland Science, 2014

●Grade Assessment

GradingIn-class participation (30%), Quizzes (20%), Examinations (50%)Criteria for "Absent" & "Fail" GradesAbsent: Approved Course Withdrawal RequestFail: Total accumulated score of less than 60%

●Notes

●Contacting Faculty

Office: Rm. B508A, Building B, Graduate School of Bioagricultural Sciences Phone: 789-5209 E-mail: joyce@agr.nagoya-u.ac.jp

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 Associate 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	Berthold FISCHER Designated Professor

●Course Purpose

The purpose of the course is to present the fundamental concepts and chemical principles of inorganic chemistry. This course is the second part of a three-semester sequence in inorganic chemistry, and deals with the chemistry of main group elements.

●Prerequisite Subjects

Fundamentals of Chemistry I and IIRelated CoursesINORGANIC CHEMISTRY I

●Course Topics

Course Contents1. Hydrogen2. The Group 1 Elements: Li, Na, K, Rb, Ce3. The Group 2 Elements: Be, Mg, Ca, Sr, Ba4. Boron5. The Group 13 Elements: Al, Ga, In, Tl6. Carbon7. The Group 14 Elements: Si, Ge, Sn, Pb8. Nitrogen9. The Group 15 Elements: P, As, Sb, Bi10. Oxygen11. The Group 16 Elements: S, Se, Te, Po12. The Group 17 Elements: F, Cl, Br, I, At13. The Group 18 Elements: Noble Gases14. The Group 12 Elements: Zn, Cd, Hg

●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

Grading Participation in discussion, Quizzes, Group presentations, homework: 50 %; Final Exam 50 %TOTAL: 100 %Grade "S": 100-90% (90 or more points), "A": 89-80% (89 - 80 pts), "B": 79-70% (79-70 pts), "C": 69-60% (69-60 pts), "F": 59-0% (fewer than 59 pts). riteria for “Absent” & “Fail” GradesNagoya University approved system; students can withdraw from this course if they submit the request form to the instructor by the officially published date.

●Notes

●Contacting Faculty

Office: SA Building-318-2 (Science & Agriculture) Phone: 789-5041
Email:fischer@chem.nagoya-u.ac.jpThere are two ways to communicate with the instructor: face-to-face in the lecture or the office hour and by e-mail.

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 Associate Professor

●Course Purpose

Main purpose of this course is to acquire a logical framework for understanding fundamental organic chemistry. This framework provides an influence for the reactions of the organic compounds having important functional groups, such as hydroxyl, carbonyl, and amino groups and the reactions of their derivatives. On the basis of the knowledge, we consecutively learn how to solve practical problems in organic chemistry.

●Prerequisite Subjects

Fundamental Chemistry I and II, Organic Chemistry 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 (Sixth Edition), Peter Vollhardt and Neil Schore, (International Edition: W. H. Freeman and Company), New York, 2009, Chapters 8-9, 17-20.

●Additional Reading

●Grade Assessment

Examination (one midterm and one final: 80%); Attendance and Assessment of Homework (20%): S (100-90), A (90-80), B (80-70), C (70-60), and F (below 60)

●Notes

●Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or in the appointment time. Communication through an 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	Elective
Lecturer	Peter BUTKO Designated Professor

●Course Purpose

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

●Prerequisite Subjects

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

●Course Topics

Course Contents1 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)12 Molecular Symmetry 1 (Ch. 16)13 Molecular Symmetry 2 (Ch. 16)14 Pre-final Review15 FINAL EXAM (Ch. 10 – 16)

●Textbook

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

●Additional Reading

●Grade Assessment

GradingTwo 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.It is essential to sit in each exam during the scheduled class time. There will be NO make-up exam. In the event of a missed exam due to a serious illness, accident or family emergency, compelling written documentation of the reason for the absence will be required. If the reason is accepted, the final grade will be calculated from the appropriately weighted average from the rest of the exams. If the reason will be deemed insufficient, the absence will be unexcused, and zero points will be awarded for the missed exam.

●Notes

●Contacting Faculty

Office: SA Building-318-1 (Science & Agriculture)Phone: 789-2480E-mail: pbutko@chem.nagoya-u.ac.jp

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

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

●Course Purpose

Never 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

Fundamentals of Earth Science I & II

●Course Topics

1. 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

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: 30% (15% each)Oral presentation: 30%Written essays: 40%A student who wishes to withdraw from the course must submit a withdrawal request form to the instructor by the end of May in order to receive an “Absent” grade.A 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 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	Berthold FISCHER Designated Professor

●Course Purpose

The purpose of this course is to understand the basic concepts in processing and characterization of inorganic materials through crystal structures, amorphous structures, lattice defects and chemical reactions relating to the stabilities-phase relations-synthesis of inorganic solids.

●Prerequisite Subjects

Fundamentals of Chemistry I and II
INORGANIC CHEMISTRY I + II
Analytical Chemistry

●Course Topics

Course Contents
1. History and introduction
2. Chemical bonds and energy bands
3. Models, crystals and chemistry
4. Crystal and glass structures
5. Several crystalline solids
6. Equilibrium phase diagrams (stability and phase relations)
7. Characterizing structure, defects and chemistry
8. Defects of inorganic solids
9. Reactions for inorganic materials synthesis
10. Diffusion and sintering
11. Several processing methods of inorganic materials

●Textbook

Ceramic Materials: Science and Engineering (1st Edition), C. Barry, Carter, M. Grant Norton, Springer, 2007

●Additional Reading

●Grade Assessment

Grading
Participation in discussion, Quizzes, Group presentations, homework: 50 %; Final Exam 50 %
TOTAL: 100 %
Grade "S": 100-90% (90 or more points), "A": 89-80% (89 - 80 pts), "B": 79-70% (79-70 pts),
"C": 69-60% (69-60 pts), "F": 59-0% (fewer than 59 pts).
Criteria for “Absent” & “Fail” Grades
Nagoya University approved system; students can withdraw from this course if they submit the request form to the instructor by the officially published date.

●Notes

●Contacting Faculty

Office: SA Building-318-2 (Science & Agriculture) Phone: 789-5041
Email:fischer@chem.nagoya-u.ac.jp

There are two ways to communicate with the instructor: face-to-face in the lecture or the office hour and by e-mail.

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	Stephan IRLE 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

Analytical Chemistry Laboratory I(1.5credits)(分析化学実験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

The purpose of this course is to master basic experimental techniques for gravimetric and volumetric analysis through laboratory practice, and to study basic chemical reactions and equilibria.

●Prerequisite Subjects

Analytical Chemistry

●Course Topics

1. Safety in a chemical laboratory
2. How to take notes, prepare flow charts, and write reports
3. Gravimetric analysis
4. Volumetric analysis
5. Treatment of chemical waste

●Textbook

Laboratory guide book (Dept. Ed)

●Additional Reading

Analytical Chemistry (Gary D. Christian), 8th Edition; Wiley

●Grade Assessment

Grades will be based on laboratory work and reports.
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 by lecturers and teaching assistants after each laboratory.

Organic Chemistry Laboratory I(1.5credits)(有機化学実験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

The purpose of the course is to allow students to experience basic handling, detection, isolation, and characterization methods of the organic compounds reviewed in the Organic Chemistry course, through practical experiments.

●Prerequisite Subjects

Basic Chemistry 1,2, Organic Chemistry 1-3

●Course Topics

1. Laboratory Safety2. Purification and Isolation of Organic Compounds3. Identification of Organic Compounds4. Synthetic Methods for Organic Compounds: Diels-Alder Reaction

●Textbook

A printed text will be distributed in class.

●Additional Reading

●Grade Assessment

Grades will be based on attendance and experiment reports.

●Notes

●Contacting Faculty

Professors and teaching assistants will answer the questions.

Physical Chemistry Laboratory(1.5credits)(物理化学実験)

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

The purpose of this course is twofold. One is to familiarize students with using various techniques employed in physical chemistry, while the other is to deepen their understanding of thermodynamics, chemical equilibria, reaction kinetics, and electrochemistry. The laboratory work is carried out in collaboration with Japanese students.

●Prerequisite Subjects

●Course Topics

1(4). Freezing Point Depression
2(5). Measuring Enthalpy of Neutralization
3(6). Zeta Potential and Flocculation Value
4(8). Analysis of Chemical Reactions by means of UV Vis-Spectroscopy
5(9). Mechanical Relaxation of Soap Micelles

(note)Numbers in parentheses correspond to numbers of the laboratory works for Japanese students.

●Textbook

A printed text will be distributed for each topic.

●Additional Reading

●Grade Assessment

Students will have to submit reports to their lecturer as homework assignment.
Students must obtain a score of 60 or higher to pass the course.

●Notes

●Contacting Faculty

Lecturers and teaching assistants will answer student's questions.

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

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	International Faculty Berthold FISCHER Designated Professor

●Course Purpose

The purpose of the course is to present the fundamental concepts and the chemical principles of inorganic chemistry. This course is the third part of a three-semester sequence in inorganic chemistry, and deals with the chemistry of transition elements as well as related subjects.

●Prerequisite Subjects

Fundamentals of Chemistry I and IIINORGANIC CHEMISTRY I + IIChemistry of Inorganic Materials IAnalytical Chemistry

●Course Topics

Course Contents1. Introduction to the Transition Elements: Ligand Field Theory2. The Elements of the First Transition Series3. The Elements of the Second and Third Transition Series4. Rare-Earth Elements: Scandium, Yttrium, Lanthanum, and the Lanthanides5. The Actinide Elements6. Transition Metal Complexes with -Acceptor Ligands and Organometallic Compounds7. Introduction to Bioinorganic Chemistry

●Textbook

Inorganic Chemistry (Catherine Housecroft, Alan G. Sharpe) 4th Edition; Pearson-Prentice Hall

●Additional Reading

●Grade Assessment

Participation in discussion, Quizzes, Group presentations, homework: 50 %Final Exam 50 %TOTAL: 100 %Grade "S": 100-90% (90 or more points), "A": 89-80% (89 - 80 pts), "B": 79-70% (79-70 pts), "C": 69-60% (69-60 pts), "F": 59-0% (fewer than 59 pts).

●Notes

●Contacting Faculty

Office: SA Building-318-2 (Science & Agriculture) Phone: 789-5041
Email:fischer@chem.nagoya-u.ac.jpThere are two ways to communicate with the instructor: face-to-face in the lecture or the office hour and by e-mail.

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

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Chemistry
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
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	Yuko OKAMOTO 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 Associate Professor

●Course Purpose

Main purpose of this course is to learn organic spectroscopy for structure determination and property analysis of organic compounds. The course begins with theoretical aspects of spectral techniques (NMR, UV, IR, Raman, Mass, and so on), and later moves on to solving structure from spectra-type problems. In addition, the course also covers problem-solving with regard to organic reactions in an effort to reinforce students' understanding of the structure/function of organic molecules.

●Prerequisite Subjects

Fundamental Chemistry I and II, Organic Chemistry I and 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, and HMBC)
3. Problem-Solving for Structure Determination and the Corresponding Organic Reaction

●Textbook

Organic Chemistry: Structure and Function (Sixth Edition), Peter Vollhardt and Neil Schore, (International Edition: W. H. Freeman and Company), New York, 2009, Chapters 10~21.
Other supporting materials will be given for the lectures.

●Additional Reading

●Grade Assessment

Presentation (40%) and Examination (50%); Attendance and Assessment of Homework (10%): S (100-90), A (90-80), B (80-70), C (70-60), and F (below 60).

●Notes

●Contacting Faculty

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

Polymer Chemistry(2.0credits)(高分子化学)

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

●Course Purpose

The purpose of this course is to learn the basics of polymer science. The course begins with basic polymer concepts, then proceeds to polymerization and synthesis of various structured polymers, and finishes with polymer 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	Kousuke MAKI Associate Professor	

●Course Purpose

Course PurposeTo learn physical basis of chemical phenomena such as phase and chemical equilibrium, and chemical kinetics. Advanced topics will be shown depending on the progress.

●Prerequisite Subjects

●Course Topics

Course Contents1. Review of basic thermodynamics2. Thermodynamics of multi-component systems3. Chemical equilibrium4. Phase equilibrium5. Chemical kinetics6. Advanced topics

●Textbook

1. Donald A. McQuarrie, John D. Simon Physical Chemistry: A Molecular Approach, Univ Science Books 2. Charles R. Cantor, Paul R. Schimmel Biophysical Chemistry (Pt. I-III), W H Freeman & Co

●Additional Reading

●Grade Assessment

Evaluation will be based on a report.The “Absent” grade is reserved for students that withdraw.

●Notes

●Contacting Faculty

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 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

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

●Course Topics

1.Basic Inorganic Chemistry, Complex Chemistry 2.ChemicalThermodynamics 3.Quantum Chemistry

●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

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

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 Associate Professor

●Course Purpose

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 coupounds and moves on the reactions comprising migration steps. Heterocyclic chemistry and organometallic chemistry are rapidly-expending fields, which we shell study. organometallic compounds incorporating carbon-metal bonds function as powerful necleophiles, such compounds have been widely used to 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 Expentions

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 (Sixth Edition), Peter Vollhardt and Neil Schore, (International Edition: W. H. Freeman and Company), New York, 2009, Chapters 21, 23-26.

●Additional Reading

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

Oxford, 2010.

●Grade Assessment

Examination (one midterm and one final: 80%); Attendance and Assessment of Homework (20%): S (100-90), A (90-80), B (80-70), C (70-60), and F (below 60)

●Notes

●Contacting Faculty

Students can communicate with the course instructor face-to-face either in their classes or appointment times. Communication via email 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	Berthold FISCHER 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

Course Contents
1. Crystal structures of inorganic solids
2. Bonding in inorganic solids and properties
3. Defects and non-stoichiometry
4. Electrical properties of solids and their applications
5. Magnetic properties of solids and their applications
6. Optical properties of solids and their applications
7. Thermal properties and mechanical properties of materials
8. Structural materials and composite materials
9. Inorganic materials in biology and medicine
10. Functional materials and their properties control
11. Material engineering for environmental issues
12. Nanoscience (nanomaterials)

●Textbook

• Solid State Chemistry: An Introduction (4th Edition), Lesley E. Smart, Elaine A. Moore; CRC Press 2012
• Ceramic Materials: Science and Engineering (1st Edition), C. Barry, Carter, M. Grant Norton, Springer, 2007

●Additional Reading

●Grade Assessment

Participation in discussion, Quizzes, Group presentations, homework: 50 %; Final Exam 50 %
TOTAL: 100 %
Grade "S": 100-90% (90 or more points), "A": 89-80% (89 - 80 pts), "B": 79-70% (79-70 pts),
"C": 69-60% (69-60 pts), "F": 59-0% (fewer than 59 pts).

●Notes

●Contacting Faculty

Office: SA Building-318-2 (Science & Agriculture) Phone: 789-5041
Email:fischer@chem.nagoya-u.ac.jp

There are two ways to communicate with the instructor: face-to-face in the lecture or the office hour and by e-mail.

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	Stephan IRLE Professor	

●Course Purpose

“How can computers help with chemistry?” The purpose of this course is to introduce computer science from a chemist’s perspective. The course begins with an introduction to the basic use of computers for data search and molecular structure and spectroscopic visualization, and introduces FORTRAN 90 as a way to solve simple scientific problems in an efficient way.

●Prerequisite Subjects

Mechanics, Statistical Mechanics

●Course Topics

Course Contents

1. Using the computer: Searching for information
2. Constructing and viewing 3-dimensional models of molecules: GaussView, MOLDEN programs
3. Overview over commercial molecular modeling packages
4. Introduction to FORTRAN 90: Compilers, etc.
5. Data Types, Constants, and Variables
6. If, else if, case expressions
7. Do loops
8. Functions and subprograms
9. Application: Data processing and visualization using GNUplot
10. Molecular dynamics simulations

●Textbook

Larry Nyhoff, Sanford Leestma: Introduction to FORTRAN 90 (Japanese version available)

●Additional Reading

●Grade Assessment

By submitting assignments

●Notes

●Contacting Faculty

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

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 Chemistry2. Chiral Catalysts for Enantioselective Synthesis3. Transition Metal Catalysts for Unreactive Bond Activation4. Synthesis of Optoelectronic Materials5. 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 based on oral and written examinations. 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 the 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
Oral and Paper Examinations. 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/Biotechnology Laboratory(5.5credits)(化学・生物工学実験)

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

●Course Purpose

The purpose of the course is to (1) understand the concepts underlying experiments in the fields of inorganic chemistry, physical chemistry, organic chemistry, and analytical chemistry. (2) learn the safe procedures of handling laboratory equipment, (3) become accustomed to handling of compounds, (4) study basic theories, instrumentations , and procedures of various instrumental analyses, (5) develop ability to discuss the results obtained, and (6) practice how to write reports. Laboratory work will be carried out in collaboration with Japanese students.

●Prerequisite Subjects

Physical Chemistry 1-2, Quantum Chemistry 1-3, Inorganic Chemistry 1-3, Physical Chemistry Laboratory, Chemistry of Inorganic Materials 1-2, Organic Chemistry 1-5, Polymer Chemistry, Current Organic/Polymer Chemistry, Analytical Chemistry

●Course Topics

(Topics for students in Applied Chemistry Course)1. Dye-sensitized solar cell 2. Catalysis on decomposition of hydrogen peroxide over various catalysts 3. Low temperature synthesis and characterization of glass and ceramic materials by sol-gel method 4. Characterization of polymers 5. Experiments of computer chemistry and photo-& radiation chemistry 6. Synthesis and evaluation of biomedical ceramics 7. Synthesis and evaluation of ferrite nano particles 8. Synthesis of layered double hydroxide and its application to wastewater treatment 9. Contact angle goniometry for surface tension measurements of solid surfaces10. Synthesis of Organic Compounds I: Carbon-Carbon Bond Class Formation with Enolate Anions 12. Synthesis of Organic Compounds II: Synthesis of Amino Ketones via Stevens Rearrangement 13. Synthesis of Organic Compounds III: Synthesis of 1,2-Diphenylethane Derivatives 14. Synthesis of Organic Compounds IV: Beckmann Rearrangement of Cyclohexanone Oxime and Polymerization of Caprolactam into Nylon-6 15. Synthesis of Organic Compounds V: Cross-Coupling Reaction with Grignard Reagent and Chemiluminescence with Luminol16. Electro analytical Chemistry 17. Absorption spectrophotometry 18. Infrared spectroscopy 19. Flame spectroscopy 20. Atomic absorption spectrometry 21. High performance liquid chromatography 22. Gas chromatography(Topics for students in Biotechnology Course)1. Fundamental experiment in genetic engineering2. Microbial culture3. Enzymatic reaction and inhibitors4. Lidocaine as a synthetic drug5. Synthesis of artificial DNA and functional evaluation.

●Textbook

A printed text will be provided for each topic.

●Additional Reading

Analytical Chemistry (Gary D. Christian), 8th Edition; Wiley

●Grade Assessment

Grades will be based on laboratory work and report 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 the questions.

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(2.5credits)(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(2.5credits)(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)(社会環境工学概論)

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

●Course Purpose

To learn the contributions of Civil Engineering and Architecture to develop the environment that forms our society

●Prerequisite Subjects

●Course Topics

Field trips to construction sites and lectures about construction system and architecture.

●Textbook

●Additional Reading

●Grade Assessment

Reports:::::

●Notes

●Contacting Faculty

Contact to Professor MizutaniEmail mizutani@civil.nagoya-u.jp

Introduction to Applied Physics/ Materials and Energy Engineering(2.0credits)(物理・材料・エネルギー工学概論)

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

Introduction to Production Engineering(2.0credits)(生産工学概論)

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

●Course Purpose

Lecturers from Japanese leading industries provide the knowledge of the current status of production engineering in Japan. Developing the ability of understanding English lectures is expected.

●Prerequisite Subjects

none

●Course Topics

1. Production engineering in automobile industry 2. Production systems for automotive parts 3. Production engineering in aerospace industry 4. Production systems for aerospace products Foreign students have first priorities. The maximum number of students is limited to 30. In some lectures, group discussions and assignments may be done. Sufficient level of English language capability, TOEIC score of 600 or its equivalent as a minimum, is required.

●Textbook

Lecture notes are provided.

●Additional Reading

None

●Grade Assessment

Reports

●Notes

●Contacting Faculty