Fundamentals of Physics III

Registration Code	0051221	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Quarter 1) / Mon. & Wed. / 2 (10:30～12:00)		
Instructor	TANIYAMA Tomoyasu		
Target Schools (Programs)	Sc(P・C・B)・En(P・C・Au)・Ag(B)		

●Goals and Objectives of the Course

This is the third of a series of FP courses that cover the fundamentals of physics, introducing the concepts and laws of electricity and magnetism. Electricity and magnetism are important for understanding nature, and are essential for studying science and engineering. Students learn the fundamentals of electricity and magnetism and its mathematical descriptions and will be able to solve a range of problems in electricity and magnetism.

By the end of this course, students will be able to: 1) Understand the concepts of electric fields, electric potential, capacitance, current and resistance, magnetic fields, induction and inductances, etc. 2) Understand Coulomb's law, Gauss' law, law of Biot and Savart, Ampere's law, Faraday's law, Lenz's law, etc., and solve actual problems in electricity and magnetism. 3) Find mathematical solutions to problems in electricity and magnetism expressed by equations and explain the physical meanings of the solutions.

●Course Prerequisites

Fundamentals of Physics I & II and Calculus I&II.

●Course Contents/Plan

Chapter 21: Electric Charge
Chapter 22: Electric Fields
Chapter 23: Gauss' Law
Chapter 24: Electric Potential
Chapter 25: Capacitance
Chapter 26: Current and Resistance
Chapter 27: Circuits
Chapter 28: Magnetic Fields
Chapter 29: Magnetic Fields Due to Currents
Chapter 30: Induction and Inductance

●Course Evaluation Methods

Class attendance is required - absentee must give a valid reason (e.g. doctor's certificate). A student will receive the ABSENT grade if his lecture attendance is below 75% or he does not sit for either Intermediate Exam or Final Exam without valid reason. After either exam, a student who wishes to receive the ABSENT grade must see Prof. Taniyama within one week after the exam. Students need to submit a Course Withdrawal Request Form when requesting course withdrawal. Weightage of course components: Class participation and attendance: 5%, Lecture Assignment: 15%, Intermediate Exam: 40%, Final Exam: 40%.

●Notice for Students

This course is as intensive as (if not more) than other FP courses. You are expected to register for Fundamental Physics Tutorial IIa (FPTIIa) and to spend at least several hours per week studying in order to do well.

Textbook	Fundamentals of Physics Extended 9th or 10th Edition International Student Version with WileyPLUS Set by Halliday, Resnick and Walker (John Wiley & Sons) (ISBN: 9781118441497)
Reference Book	Feynman Lectures On Physics (Vol. 2) by Richard Phillips Feynman (Pearson PTR) (ISBN-13: 978-0465024940)
Reference website	
Message	

Fundamentals of Physics IV

Registration Code	0051222	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Quarter 2) / Mon. & Wed. / 2 (10:30～12:00)		
Instructor	GELLOZ Bernard Jacques		
Target Schools (Programs)	Sc(P・C・B)・En(P・C・Au)・Ag(B)		

●Goals and Objectives of the Course

This is the last of a series of four courses that cover the fundamentals of physics. It focuses on mechanical and electromagnetic waves, as well as optics. Both conceptual understanding and problem solving will be emphasized. Some applications will also be discussed. Understanding waves and optics is important as preparation for more advanced subjects, for example in quantum mechanics, chemistry, and engineering.

●Course Prerequisites

Fundamentals of Physics I & II. Concurrent registration for *Fundamentals of Physics III* is required. Registration for *Fundamentals of Physics Tutorial IIb* is recommended as it serves as tutorial for this course.

●Course Contents/Plan

- Review of mechanical oscillations (part of chapter 15)
- Short introduction to electromagnetic oscillations (part of chapter 30)
- Fundamentals of waves and mechanical waves (chapter 15)
- Introduction to Maxwell's equations (part of chapter 32)
- Electromagnetic waves (chapter 33)
- Images (geometrical optics) (part of chapter 34)
- Optical interference (chapter 35)
- Introduction to optical diffraction (part of chapter 36)

●Course Evaluation Methods

Need to submit a Course Withdrawal Request Form when students have no intention of finishing a course during the semester. Deadline for submitting this request is just before the final examination.
Weightage of course components : Class attendance: 10%; Intermediate tests: 40%; Final test: 50%

●Notice for Students

With two lectures and a tutorial (if you register for it) per week, it is important to work regularly and immediately clear any misunderstanding in order to do well in the course and tutorial.

Textbook	Fundamentals of Physics Extended 10th Edition International Student Version with WileyPLUS Set (John Wiley & Sons, 2010　ISBN-13: 978-1118230725)
Reference Book	Feynman Lectures On Physics (Vol. 2) by Richard Phillips Feynman (Pearson P T R)
Reference website	
Message	

Basic Mathematics

Registration Code	0051321	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Mon. / 3 (13:00 – 14:30)		
Instructor	DARPOE Erik Olof		
Target Schools (Programs)	Hu(J)・La(S)・Ec(S)		

●Goals and Objectives of the Course
The purpose of this course is to review mathematical concepts and techniques that are frequently used in economics and social sciences.

●Course Prerequisites
No formal prerequisites. Basic skills in manipulating algebraic expressions, solving equations etc. will be helpful.

●Course Contents/Plan
1. Lines and their slopes
2. Sets, equations, absolute values
3. Functions and their graphs
4. Combinations of functions
5. Transformations of functions
6. Quadratic functions
7. Polynomial functions
8. Exponential functions
9. Logarithmic functions
10. Systems of equations and inequalities
11. Linear systems, vectors and matrices
12. Derivatives
13. Extremal value problems

●Course Evaluation Methods
The examination consists of a midterm exam (40% of the total score), a final exam (50%), homework (10%).

Course withdrawal: Any student who does not participate in the final exam will receive the grade "Absent". It is not necessary to submit a course withdrawal request form.

●Notice for Students
It is recommended to prepare for each lecture by reading corresponding chapter in the textbook in advance.
As the students at this course are likely to have rather different backgrounds in and knowledge of mathematics, the workload required to follow the course will vary depending on individual circumstances.

Textbook	Rhonda, Huettenmueller: ***Pre-calculus demystified***, second edition McGraw-Hill Education; 2 edition (2012) ISBN-13: 978-0071778497
Reference Book	Additional material may be provided during the course.
Reference website	
Message	

Laboratory in Biology A

Registration Code	0011371	**Credits**	1.5
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II(1st year, Spring Semester) /Mon./ 3 (13:00～14:30) & 4 (14:45～16:15)		
Instructor	OHKAWA Taeko, DOI Kazuyuki		
Target Schools (Programs)	Ag(B)		

●Goals and Objectives of the Course

The aim of this course is to provide freshman/sophomore level students with the conceptual framework and factual knowledge of biology through observations and experiments from laboratory to field scales, covering morphology and physiology of animals, plants, and fungi. The goal of this course is to obtain basic skills necessary to deal critically with the rapidly changing science of biology and to understand the applications of biology.

●Course Prerequisites

None

●Course Contents/Plan

1-1-1 Tree Identification
1-1-2 Interspecific comparison of tree leaves
1-1-3 Tree census 1
1-1-4 Tree census 2 (Analyses of tree census data)
1-2-1 Morphology of Plant 1 (Plant tissue systems and their cellular structures)
1-2-2 Morphology of Plant 2 (Leaf Surface Structure)
1-2-3 Morphology of Plant 3 (Structure of seedlings)
1-2-4 Protein Electrophoresis (SDS-Polyacrylamide Gel Electrophoresis)
1-3-1 Morphology of Animals 1 (Dissection of the goldfish)
1-3-2 Morphology of Animals 2 (Observation of Animal Tissue Sections)
1-3-3 Vertebrate Hormones (Regulation of metamorphosis in the African clawed frog larvae)
1-3-4 Morphology of Aves (Anatomy of the digestive system and urogenital system of the quail)

●Course Evaluation Methods

Grading will be based on attendance, lab reports, and assessment of performance in the lab.
The course withdrawal system is adopted. Students can withdraw from this course by submitting a request by the end of May

●Notice for Students

We highly recommend to prepare each class by reading the corresponding chapter in the textbook.
Students are required to attend all the classes. Students should inform their instructors of dates they will miss class due to an excused absence prior to the date of that anticipated absence**.**

Textbook	An original textbook will be distributed in the class.
Reference Book	Will be introduced in the class.
Reference website	
Message	

Linear Algebra II

Registration Code	0052221	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Tue. / 2 (10:30～12:00)		
Instructor	BACHMANN Henrik		
Target Schools (Programs)	Hu(J)・La(S)・Ec(S)・Sc(P・C・B)・En(P・C・Au)・Ag(B)		

●Goals and Objectives of the Course
Linearity is one of the most fundamental concepts for the handling of quantities in current natural science. Indispensable in quantum mechanics and relativity, its use has spread across all branches of natural science and beyond. Linear algebra, developed in the nineteenth century, is the mathematical theory of linearity. The second half of this one-year course focuses on advanced concepts of Linear algebra, such as the notion of a (real) vector space, orthogonal maps, determinants, eigenvalues and eigenvectors. Its purpose is to give a deeper and broader understanding of the mathematical theory of linearity, as well as increased proficiency in mathematical reasoning and proof techniques.

●Course Prerequisites
While not a formal requirement, Linear Algebra I is strongly recommended.
Check https://www.henrikbachmann.com/la12019.html for the content of Linear Algebra I.

●Course Contents/Plan
Orthogonal maps, vector spaces, determinants and their applications, eigenvalues and eigenvectors, applications of eigenvalue theory, linear differential equations.

●Course Evaluation Methods
There will be two main, written exams: midterm (35%) and final (45%). Additionally, there will be homework assignments (10%) and quizzes (10%). The final grade will be determined by the total amount of points obtained according to the following scale: S: 90-100, A: 80-89, B: 70-79, C: 60-69, F:0-59.

Course withdrawal: Any student who does not participate in the final exam will receive the grade “Absent”. It is not necessary to submit a course withdrawal request form.

●Notice for Students
1. The reference book is available in the Main library and in the Science library (enough copies in total for all students).
2. It is strongly recommended to register also to Mathematics Tutorial II b.

Textbook	None.
Reference Book	Otto Bretscher: ***Linear Algebra with Applications***, fourth edition, Pearson
Reference website	https://www.henrikbachmann.com/la2_2020.html
Message	The website will contain all necessary information on this course.

Laboratory in Biology B

Registration Code	0012372	**Credits**	1.5
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Tue. / 3 (13:00～14:30) & 4 (14:45～16:15)		
Instructor	HISAMOTO Naoki, KINOSHITA Toshinori		
Target Schools (Programs)	Sc(P・C・B)・En(P・C)		

●Goals and Objectives of the Course
In this training, you will learn how to handle animals, plants and microorganisms, how to observe them, and how to operate experimental observation instruments. The aim is to gain a basic understanding of the structure and function of various living things through their observation by the naked eye or through a microscope, their dissection and by experimentation on them. The goal is also to learn how genes are related to structure and function, so you can understand the flow from classical biology, which had observation as its main objective, to modern biology, which pursues understanding on the molecular level.

●Course Prerequisites
In this training, experiments and observations on animals (medaka, fly, nematode), plants (onion, Arabidopsis), microorganisms (yeast), and collection and observation of oral epithelial cells or a few drops of blood are performed. We do not recommend them to students who cannot do them for any reason.

●Course Contents/Plan
01) Guidance and safety education
02) Observe plant cells
03) Plant shaping and response to gravity stimulation
04) Observation of the yeast cell cycle
05) Observation of cell division at onion root growth point
06) Observation of nematodes: effects of genetic abnormalities on animal morphology and movement
07) Looking at the genome and thinking about the information content (Drosophila larval salivary gland chromosome observation)
08) Observing the feeding behavior of Drosophila: what food do you like? Hate?
09) Learn evolution and biodiversity from medaka
10) Properties of enzymes (alkaline phosphatase)
11) Comparative observation of human blood cells and epithelial cells
12) Measurement of cell osmotic pressure by plasma separation
The contents and order may change.

●Course Evaluation Methods
Attendance and report for each experiment. As a general rule, students will not be able to earn credits unless they are present and submit reports on all practical trainings by the deadline. If you attend three or more times, your grade will be "S, A, B, C, or F" instead of "Absent."

●Notice for Students
In the first class, be sure to attend the training courses, which will provide you with practical training guidance, safety education, and instructions for purchased items. In subsequent lessons, read the texts in advance and understand the purpose of the experiment before starting the lesson. If you are absent from the training or your report submission is delayed due to some circumstances, be sure to contact and consult the training teacher in advance.

Textbook	Exclusive original training books will be distributed.
Reference Book	Prints will be distributed as needed.
Reference website	no website
Message	To conduct experiments safely, carefully listen to your teacher’s explanations and observe any demonstrations.

Fundamentals of Earth Science II

Registration Code	0052521	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Tue. / 5 (16:30～18:00)		
Instructor	HUMBLET Marc Andre		
Target Schools (Programs)	Sc(P・C・B)・En(P・C・Au)・Ag(B)		

●Goals and Objectives of the Course

This course explores the interactions between humanity and the Earth system. The Earth is a dynamic planet where the evolution of the environment and that of life are closely related. Human societies are profoundly influenced by climate change and geologic events such as volcanic eruptions and earthquakes. Today the growing human population and its use of natural resources are affecting the environment on a global scale to an extent never attained before.

By taking this course students will acquire a basic knowledge of volcanology and seismology, past and present climate change, and the nature and use of geologic resources. Learning about the interactions between humanity and the Earth system is needed to use Earth's limited natural resources in a sustainable manner, minimize the risks of natural hazards and envisage a safe future for us all.

●Course Prerequisites

None

●Course Contents/Plan

1. Introduction – review of plate tectonics
2. Volcanoes
3. Seismology I: The nature of earthquakes and their effects
4. Seismology II: Reconstruction of Earth's interior based on the behavior and detection of seismic waves
5. Biogeochemical cycles I: The Water Cycle
6. Biogeochemical cycles II: The Carbon Cycle
7. Climate I: Introduction to the Climate System
8. Climate II: Natural Variations at geologic timescales
9. Climate III: Recent Global Change
10. Nature and use of geologic resources

●Course Evaluation Methods

Two quizzes (MCQ): 20% (10% each)
Mid-term exam: 40%
Final exam: 40%
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%
A student who wishes to withdraw from the course needs to submit a Course Withdrawal Request Form by the end of May in order to receive an "Absent" grade. This deadline does not apply to students who drop the class part-way through for an exceptional reason (e.g., illness, accident).

●Notice for Students

There are no homework assignments in this course. Evaluation is based on the two quizzes, the mid-term exam, and final exam. Students are encouraged to ask questions in class.

Textbook	There is no required textbook for this course. Please refer to the recommended reading below for an additional source of information.

Reference Book	Title:Understanding Earth Authors: John Grotzinger & Thomas H. Jordan Publisher: W. H. Freeman Issue year: 2014 (7th edition) ISBN: 978-1464138744
Reference website	None
Message	There are no specific office hours for personal consultation outside class time. However, students are encouraged to make an appointment by e-mail beforehand.

Information Literacy

Registration Code	0013301	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Wed. / 3 (13:00～14:30)		
Instructor	KURIMOTO Hidekazu		
Target Schools (Programs)	Hu(J)・La(S)・Ec(S)		

●Goals and Objectives of the Course

This course is designed to promote an understanding of the study of natural sciences and to foster independent decision-making capabilities. Especially, the goal of this course is to help students master, through lectures and practical training, the fundamentals of information literacy. This refers to the ability to use information and communication technology such as computers and online networks for the gathering, transmission, organization and analysis of information. While the internet allows us to gather and transmit information at will, there are a few standard rules that need to be followed.

The objectives of the course is for students to learn how to use computers and networks by fully understanding these basic rules.

●Course Prerequisites

Students must be able to use the e-mail user account listed in the Nagoya University ID Notification.

●Course Contents/Plan

(01) Information Literacy overview
(02) Overview of computer literacy, and word processing
(03) Electronic mail and information exchange
(04) Information security
(05) Ethics and etiquette in a network information-based society
(06) Information retrieval system (basic)
(07) Searching for information on the internet (applied / translation)
(08) The science and technology supporting an information-based society.
(09) Information representation on web pages (basic)
(10) Information representation on web pages (applied)
(11) Information processing using spreadsheet software (basic)
(12) Information processing using spreadsheet software (applied)
(13) Information processing using spreadsheet software (advanced)
(14) How to make PowerPoint presentation
(15) Actual presentation using PowerPoint

The course will cover the content above, but the order may vary slightly.
In order to promote autonomous learning through e-learning contents, experiments will be conducted using academically effective practical methods and content.

●Course Evaluation Methods

Students will be evaluated in comprehensively on performance in reporting (70%) and class participation (30%). Grading is based on the five-grade evaluation defined by NU regulations.
A withdrawal system is used for students wishing to withdraw from this course.
* Details will be given during the first lecture.

●Notice for Students

The enrollment capacity for G30 program is 8 students.
Students must submit a report about the subject assigned in class.
Students are expected to implement active learning in out-of class, as indicated in the coursework.
Always carry your Nagoya University ID (account) and password with you.
The practical training classes are inter-related and lateness or absence will interfere with the coursework.

Textbook	Course materials provided by e-Learning Management System (Course-related links) http://www.human.nagoya-u.ac.jp/~kuri/lect/nulias.html
Reference Book	Course materials provided by e-Learning Management System (Course-related links) http://www.human.nagoya-u.ac.jp/~kuri/lect/nulias.html

Reference website	
Message	

Laboratory in Chemistry

Registration Code	0053321	**Credits**	1.5
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II(1st year, Spring Semester) / Wed. / 3 (13:00～14:30) & 4 (14:45～16:15)		
Instructor	SAMJESKE Gabor Arwed, BUTKO Peter, SHUKU Yoshiaki		
Target Schools (Programs)	Sc (P・C・B)・En (P・C・Au)・Ag (B)		

●Goals and Objectives of the Course

The objective of this course is to learn how to effectively perform experiments in a detailed, oriented manner including carefully taking notes of the procedures, findings, and questions that may arise from the experiments. The other objective is to clearly and concisely convey to others the findings of the experiments that support your conclusion. Motto: Perform the experiments by yourself, visually observe and record what happened in the experiments, and report the results clearly.

●Course Prerequisites

Students must have taken, or be taking concurrently, at least one of the following courses: Fundamentals of Chemistry 1, Fundamentals of Chemistry 2.

IMPORTANT: This course is a **PREREQUISITE** for **0681100 ANALYTICAL CHEMISTRY, Year 2, Term III, Fall Semester**

●Course Contents/Plan

week 1: Orientation and Safety Walkthrough.
week 2: Lecture 1 Reaction of Inorganic Ions and Ion Exchange Equilibrium.
week 3: Experiment 1 a. Estimation of Liquid Quantity. b. Dissolution of Salts. c. Water Soluble Salts and Solubility.
week 4: Experiment 2 a. Reaction of Metal Ions with Hydrogen Sulfide. b. Metal Hydroxides.
week 5: Experiment 3 a. Separation of Inorganic Ions and their Identification.
week 6: Lecture 2 Synthesis of Organic Compounds and Inorganic Compounds, Volumetric Analysis and Titration.
week 7: Experiment 4 a. Synthesis of Acetylsalicylic Acid. b. Measurement of Melting Point.
week 8: Experiment 5 a. Synthesis of Potassium Trioxalate Ferrate (III) Trihydrate. b. Photochemical Reaction.
week 9: Experiment 6 a. Titration of Monovalent Acids.
week 10: Lecture 3 Energy of Electromagnetic Waves and Spectra, Rate of Chemical Reaction and Energy.
week 11: Experiment 7 a. Atomic Spectra and Atom Structure. b. Spectra of Various Light Sources.
week 12: Experiment 8 a. Absorption Spectrum of Phenolphthalein. b. Determination of Concentration by Absorption Photometry.
week 13: Experiment 9 a. Chemical Oscillation Reactions.

●Course Evaluation Methods

Attendance is necessary for every week. In the event of a missed class due to a serious illness, accident or family emergency, compelling **written** documentation of the reason for the absence will be required. Tardiness will negatively impact your grade. **You must submit your assignment every week before the start of the class**. **Late assignment submissions result in points being deducted.** Plagiarism of assignments will not be tolerated.

Grading is based on participation in discussion and Q&A (8%), experiment reports (72 %),
final oral conversation (20 %); TOTAL: 100 %.

The Nagoya University course withdrawal system is adopted. Students need to submit a Course Withdrawal Request Form when they have no intention of finishing the course during the semester. **Course Withdrawal is**

only possible until week 7 (experiment 4)

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% (below 59 pts).

WARNING: Missing more than three classes (it does not matter whether excused or not) means automatically failing the course.

●Notice for Students

This course has an accompanying manual, which will be available in the first week during the Orientation and Safety Walkthrough. This book is mandatory for the assignments (laboratory reports) and the questions to be answered.

Textbook	Introductory Chemistry Laboratory Manual, Shizuaki Murata, Fumi Urano, and Masahiro Yoshimura, Hideto Ito (Nagoya University, 2019)
Reference Book	
Reference website	
Message	

Special Mathematics Lecture (Graph Theory)

Registration Code	0053621	**Credits**	2.0
Course Category	Science Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Wed. / 6 (18:15～19:45)		
Instructor	RICHARD Serge		
Target Schools (Programs)	Hu(J)・La(S)・Ec(S)・Sc(P・C・B)・En(P・C・Au)・Ag(B)		

●Goals and Objectives of the Course

Graphs are playing an essential role in many fields, as for example in computer science, in optimization and in algorithmic complexity. Studying the abstract theory of graphs provides the tools for dealing with very diverse questions and with numerous applications.

During this course we shall study the abstract theory of finite graphs, and see extensions to infinite graphs. Applications will be considered according to the interest and to the motivation of the students.

●Course Prerequisites

Basic knowledge on calculus and linear algebra, as provided in Calculus I & II and in Linear algebra I & II. Motivated 1st year students can also attend without these prerequisites but after a discussion with the instructor.

●Course Contents/Plan (tentative)

Basics

Structures and representations

Trees and spanning trees

Connectivity and planarity

Graph colorings

Flows

Infinite graphs

●Course Evaluation Methods

The final grade will be based on the active participation during the lectures and on some written reports. Computer implementations of some exercises will accepted as reports.

●Notice for Students

It is expected that the students will show a certain maturity in studying independently and in choosing some exercises and problems to solve. Study sessions will be organized on a weekly basis.

This course in an optional subject which does not count towards the number of credits required for graduation in any program at Nagoya University.

Textbook	Free reference books will be provided during the lectures
Reference Book	Free reference books will be provided during the lectures
Reference website	http://www.math.nagoya-u.ac.jp/~richard/SMLspring2020.html
Message	

Fundamentals of Biology II

Registration Code	0054223	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Thu. / 2 (10:30～12:00)		
Instructor	VASSILEVA Maria		
Target Schools (Programs)	Sc(P・C・B)・En(C・Au)・Ag(B)		

●Goals and Objectives of the Course

Goals: This course`s main focus is to provide students with working understanding on how the human body functions, and connect it to health and disease. Short introduction is given on basic concepts of ecology. The course emphasizes on conceptual understanding of the biological topics discussed, rather than on memorization of terms and facts. Course assignments are prepared with the goal of providing an opportunity to practice conceptual and analytical thinking.

Objectives: Students will gain the the ability to use their understanding of human physiology to take informed decisions in everyday health-related situations. Ecology section will allow students to critically evaluate agricultural and ecological issues. Students will have a regular opportunity to engage in discussions, and hone their teamwork skills on team projects.

●Course Prerequisites

There is no prerequisite knowledge for this course. Even students who didn't take Fundamentals of Biology 1, or didn't study Biology in high school, are encouraged to join. Exchange students are also welcome.

●Course Contents/Plan

1. Introduction to the basics of life
2. Animal anatomy and physiology
   - 2.1 Unifying concepts of animal structure and function
   - 2.2 Nutrition and digestion
   - 2.3 Gas exchange
   - 2.4 Circulation
   - 2.5 The immune system
   - 2.6 Control of water balance
   - 2.7 Hormones and the endocrine system
   - 2.8 Reproduction and embryonic development
   - 2.9 Nervous system
   - 2.10 The senses
   - 2.11 How animals move
3. Introduction to Ecology
   - 3.1 The biosphere: an introduction to Earth`s diverse environments
   - 3.2 Behavioral adaptations to the environment
   - 3.3 Population ecology
   - 3.4 Communities and ecosystems
   - 3.5 Conservation biology

●Course Evaluation Methods

Evaluation is based on in-class participation (10%), group assignments (10%), individual written assignments (10%) and two exams (total of 70%).

* Students who do not intent to complete the course need to submit a Course Withdrawal Form. This can be done at any time during the course.

●Notice for Students

* Students are expected to read the appropriate textbook chapter before class. Classes emphasize discussions

and problem-solving questions, thus coming prepared is essential. *Weekly written assignments - summary of the upcoming class material in the form of mindmap - are the core assignments for this course. Exams emphasize on analytical and problem-solving skills.	
Textbook	1. Campbell Biology: Concepts & Connections; Pearson, ISBN 978-1292229478 (The same textbook as in Fundamentals of Biology I)
Reference Book	OpenStax Biology 2e Free downloadable textbook (http://openstaxcollege.org) This is an excellent alternative to the main textbook for the course.
Reference website	
Message	* Mastering Biology (www.masteringbio.com) is an online system that accompanies the main textbook for this course. This system will not be integrated into the course assessment methods.

Fundamentals of Chemistry II

Registration Code	0054321	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Thu. / 3 (13:00～14:30)		
Instructor	SHIN Jiyoung		
Target Schools (Programs)	Sc(P・C・B)・En(P・C・Au)・Ag(B)		

●Goals and Objectives of the Course
The main goal of this course is to grasp what chemistry is all about and to learn the respective key principles and elementary knowledge in different subjects of chemistry. Fundamentals of Chemistry II begins with chemical kinetics and equilibrium, advances to thermodynamics and electronics, and finishes with chemical structures, properties, and reactions. On the basis of the knowledge, educated following the course contents, the students will be able to solve chemistry problems in each subject of physical, electro-, nuclear, inorganic, solid-state, organic, and biological chemistries, from simple to complex and hybrid.

●Course Prerequisites
Fundamentals of Chemistry I

●Course Contents/Plan

Class 1. Chemical Kinetics (Ch.13 in the textbook) --- Rate Law & Reaction Order; Determination Method of Initial Rates; Integrated Rate Law (Zeroth, First, and Second Ordered); Arrhenius Equation; Reaction Mechanisms and Elementary Reactions; Rate Determining Step; Catalysis

Class 2. Chemical Equilibrium (Ch.14 in the textbook) --- Equilibrium State and Equilibrium Constant; Le Châtelier's Principle and Altering Factors for Equilibrium Mixture

Class 3. Aqueous Equilibria: Acids and Bases (Ch. 15 in the textbook) --- Concept of Acid & Base and the Descriptions, Strengths of Acid and Base and Their pH; Equilibrium Constants (K_a and K_b)

Class 4. Applications of Aqueous Equilibria (Ch.16 in the textbook) --- Neutralization Reactions Depended on the Acid and Base Strengths; Buffer Solution and Hedrson-Hasselbalch Equation; Titration Progress and the pH Titration Curves; Titration of Polyprotic Acid with Strong Base; Solubility and Precipitation Equilibria for Ionic Compound

Class 5. Summary and Evaluation for the Classes 1-4 with Practice Problems and the Solution Process

Class 6. Thermodynamics: Entropy, Free Energy, and Equilibrium (Ch. 17 in the textbook) --- Spontaneous Reactions and Their Enthalpy and Entropy; Standard Entropies, Enthalpy, Gibbs Free-Energy; Three Laws of Thermodynamics; Reactions und Nonstandard-State Conditions

Class 7. Electrochemistry (Ch. 18 in the textbook) --- Half-Reactions and the Overall Redox Reactions; Galvanic Cells; Shorthand Notation for Galvanic Cells; Cell Potentials and Free-Energy Changes; Nonstandard-State Redox Reaction and Nernst Equation; Electrochemical Determination and pH; Standard Cell Potentials and Equilibrium Constants; Batteries; Corrosion; Electrolytic Cells

Class 8. Nuclear Chemistry (Ch. 19 in the textbook) --- Nuclear Reactions; Radioactivity; Nuclear Stability; Radioactive Decay Rates; Nuclear Fission and Fusion; Radioactivity Determination

Class 9. Transition Elements and Coordination Chemistry (Ch. 20 in the textbook) --- Electron Configurations, Properties, and Oxidation States of Transition Elements; Coordination Compounds and the Nomenclature; Ligation Feature of Transition Metal Complexes; Isomers; Valence Bond Theory; Crystal Field Theory; Ligand-Strength and Energy Splitting; Diamagnetic and Paramagnetic Metal Complexes

Class 10. Summary and Evaluation for the Classes 6-9 with Practice Problems and the Solution Process

Class 11. Metals and Solid-State Materials (Ch. 21 in the textbook) --- Metallic Elements; Metallurgy; Bonding

Aspects of Metals; Insulators, Semiconductors, and Conductors; Doped Semiconductors and Their Diode Systems; Solar Cells; Superconductors and Meissner Effect

Class 12&13. The Main-Group Elements (Ch. 22 in the textbook) --- General Properties & Periodic Trends; Properties of the Second-Row Elements; Properties of Group 1A Elements (Hydrogen & Alkali Metals); Properties of 2A (Alkaline-Earth Metals); Properties of Group 3A, 4A, 5A, and 6A; Properties of Group 7A (Halogens); Group 8A (Noble Gasses); Magnetic Property of Oxygen (Oxide, Peroxide, and Superoxide)

Class 14. Organic and Biological Chemistry (Ch. 23 in the textbook) --- Organic Molecules and Their Structures (Formation of Molecule (Hybridization and Valence Bond Theory); Alkane, Alkene, and Alkyne); Functional Groups and Nomenclature of Organic Compounds; Isomers; Formal Charge and Oxidation State; Conjugated System and Resonances; Simple Reactions of Organic Molecules; Metabolism and Catabolism in Biological Chemistry; Amino Acids, Peptides, and Proteins; Carbohydrates; Nucleic Acids; Transfer of Genetic Information

Class 15. Summary and Evaluation for the Overall Classes (1-14) with Practice Problems and the Solution Process

●Course Evaluation Methods

Examination [total 70%: two midterms (20% for each) and one Final (30%)], Attendance and Assignments (30%).

Grading System: GPA (Grade Point Average) grading system is based on 'five-step' grade scale: S, A, B, C, and F (S: $x \geqq 90$, A: $90 > x \geqq 80$, B: $80 > x \geqq 70$, C: $70 > x \geqq 60$, and F: $60 > x$). No attendance of the final examination leads to "Absent" grade.

●Notice for Students

Course withdrawal and failure: ***Students need to submit a Course Withdrawal Request Form when requesting course withdrawal**. In the cases of any unavoidable reasons such as sickness, accident, or no attendance school, student(s) may get a grade of 'Absent' through the judgment of the course-instructor and the students, when the student(s) submit a 'Course Withdrawal Request Form' to receive the 'Absent' grade. No submission of sickness/absence reports and lack of attendance score will result in 'F' grade, if the student takes the final examination. It is for the protection of other attendances in the course from frequent absences of specific/uncertain student(s).

Cautious information: Whoever provides any suspicious action in any exam will lose his/her entire credits of all coursework in the current semester, based on the University law.

Textbook	Chemistry (John E. McMurry, Robert C. Fay, and Jill K. Robinson), Seventh Edition: Global edition, 2016 (ISBN 10: 9781292092751)
Reference Book	General Chemistry: Principles and Modern Applications (Ralph, H. Petrucci, F. Geoffrey Herring, Jeffry D. Madura, Carey Bissonnette), 11th Edition, Toronto, Pearson Canada, 2016 (ISBN 10: 0132931281)
Reference website	https://ct.nagoya-u.ac.jp/portal/
Message	Students can communicate with the course instructor face-to-face either in the class or through appointment. Communication through email (instructor's email: jyshin@chembio.nagoya-u.ac.jp) also available.

Calculus II

Registration Code	0055221	**Credits**	2.0
Course Category	Sciences Basic		
Term (Semester) / Day / Period	G-II (1st year, Spring Semester) / Fri. / 2 (10:30～12:00)		
Instructor	RICHARD Serge		
Target Schools (Programs)	Hu(J)・La(S)・Ec(S)・Sc(P・C・B)・En(P・C・Au)・Ag(B)		

● Goals and objectives of the Course

Analysis is the field of mathematics that describes and analyzes quantitative changes, and the central methods are differential and integral calculus. These methods are essential techniques in natural science, and have recently found increasing applications also in social sciences.

The aim of the second half of this one-year course is to provide a solid understanding of functions of several real variables. The students will become familiar with the various tools necessary for the analysis of such functions.

● Course Prerequisites

Some notions on functions of one variable, as seen in Calculus I. A basic knowledge of linear algebra will be an asset.

● Course Content/Plan

The basic notions related to the study of functions of several variables, as for example: partial derivatives, maximum and minimum, implicit functions theorem, multiple integrals, change of variables, Jacobian matrix, surface and line integrals. Some elements of vector calculus will also be introduced.

● Evaluation Methods and Criteria

The final grade will be determined by quizzes (30%), the midterm (30%) and a final exam (40%). The grading scale will be **S**: 90-100, **A**: 80-89, **B**: 70-79, **C**: 60-69, **F**: 0-59. It is necessary to submit a Course Withdrawal Request Form when the student has no intention of finishing the course during the semester.

● Notice for Students

It is strongly encouraged to attend the Mathematics Tutorial 2a which is linked to this course.

Textbook	Free reference books and lecture notes are available on the website of the course
Reference Book	Free reference books and lecture notes are available on the website of the course
Reference website	http://www.math.nagoya-u.ac.jp/~richard/spring2020.html
Message	