

<1> Sociology

Class Schedule: Tuesday, 1st. (2 credits)

Category: Expansion Subjects-Social Sciences

Course Code: CB21206 Instructors: LIU Jing

1. Class Subject

Education and Sustainable Development Goals (SDGs)

2. Object and Summary of Class

The 2030 Agenda for Sustainable Development, which was adopted by the United Nations in 2015, has become a shared blueprint for peace and well-being of all human beings and the planet. Education, either as a goal and a means for achieving the global goal for sustainable development, has been given special attention by the global society.

This course provides a platform for participants to reconsider the relationship between education and sustainable development goals. It starts with an introduction to history and basic knowledge of sustainable development goals (SDGs) for global development by 2030. Then, it moves to understand the educational perspectives of the SDGs in global context, particularly in Asia. In the third part of the course, it discusses achievement and challenges of education and SDGs in diverse contexts in Asia. It closes by making group blueprints for education development in/for the SDGs in Asia by participants.

3. Goal of Study

Objectives of this subject are to enable students to:

1. obtain knowledge of sustainable development goals for the global society by 2030.
2. have a more comprehensive and more in-depth understanding of the relationship between education and sustainable development in the global community and the Asian context.
3. reconsider critically about the current policies and practices of education in/for sustainable development
4. raise blueprints for educational development in/for SDGs in Asia.

4. Contents and Progress Schedule

Session 1: Orientation & Introduction to Sustainable Development Goals (SDGs): A historical review

Session 2: Introduction to Sustainable Development Goals (SDGs): Understanding 17 SDG Goals

Session 3: Introduction to SDG 4

Session 4: Inequality in education & SDGs

Session 5: Quality education & SDGs

Session 6: Teachers' education & SDGs

Session 7: Group presentation: Inclusive and equitable quality education in Asia

Session 8: Higher education & SDGs

Session 9: Group discussion: Transforming teaching and learning for

sustainability

Session 10: SDG 4 in the post COVID-19

Session 11: Educational aid & SDGs

Session 12: Guest speaker: Education & Development

Session 13: Japan's practices in promoting SDG4

Session 14: Achievement & challenges of education development in/for SDGs

Session 15: Final presentation: How can we contribute to SDGs through education?

5. Evaluation Method

Participation (50%); Group works (30%); Reports (20%)

6. URL

1. United Nations (2015) Transforming our World: The 2030 Agenda for Sustainable Development. New York: United Nations. (<https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>)

2. UNESCO (2020) Global Education Monitoring Report 2020: Inclusion and education: ALL MEANS ALL. Paris: UNESCO. (<https://en.unesco.org/gem-report/report/2020/inclusion>)

7. Preparation and Review

1. The session time is limited and therefore self-directed learning is important. Students are required to prepare and review for each class.
2. Students are encouraged to collect information and topics related to the content of the class using newspapers, books, internet and other media.
3. Group-based study and discussion are highly recommended.

8. Students must bring their own computers to class

Students may need to bring their own laptops for face-to-face discussion/activities. Announcement will be made in advance.

9. In Addition

1. Materials are provided via Google Classroom.
2. Positive participation in classes is expected.
3. If you have to be absent from class, you must notify the lecturer in advance.
4. Office hours are from 13:00 to 15:00 on Tuesdays. Make an appointment in advance via e-mail or other means. The contact information for the lecturer will be given in class.

<2> History and Human Society

Class Schedule: Wednesday, 1st. (2 credits) Category: Core Subjects-Social Studies

Course Code: CB31221 Instructors: Manabu NAKAGAWA

1. Class Subject

History of Tohoku University

2. Object and Summary of Class

What sort of a university is Tohoku University?

This course covers the history of Tohoku University to help students understand the characteristics of this University from a historical perspective.

3. Goal of Study

The goal is for each of you to acquire the following knowledge and abilities through this course.

(1) To be able to understand and explain Tohoku University's history by using some concrete example.

(2) To be able to survey and describe the features of your university, department and laboratory from a historical point of view.

4. Contents and Progress Schedule

This course is centered on a lecture and a field trip.

Depending on the status of the COVID-19, face-to-face classes and fieldtrip may be replaced with online classes.

The contents and schedule are as shown below:

- (1) Introduction
- (2) Field trip (Sendai City Museum)
- (3) The Foundation of Tohoku Imperial University
- (4) Field trip (University Museum)
- (5) Open Door Policy
- (6) Development of University I
- (7) Development of University II
- (8) Student Life
- (9) Field trip (University Library)
- (10) International Students
- (11) World War II and Postwar Reforms
- (12) Field trip (University Archives)
- (13) University Campus
- (14) University Reforms
- (15) University Ideals

5. Evaluation Method

Half of your grade will be based on attendance and understanding of the course (Minute Paper*, 50%), while the other half will be based on the final report (50%).

*Students will be requested to complete the Minute Paper at the end of the class.

A student absent more than 5 sessions will not be given any credit.

6. Textbook and References

No textbooks will be used. References are handed out at every class.

7. URL

8. Preparation and Review

Students will be requested to write a short essay after each field trip.

Students will be requested to write the final report at the end of the semester.

9. Practical business

10. Students must bring their own computers to class No

11. In Addition

You must attend the first class session.

Office hours are from 13:00 to 16:00 on Wednesday. Make an appointment in advance via e-mail or other means.

<3> Physics A

Class Schedule: Tuesday, 3rd. (2 credits)

Category: Expansion Subjects-Physics

Course Code: CB23254

Instructors: Takeshi KOIKE

*This class is open for AMB students only.

1. Class Subject

Introductory Physics

2. Object and Summary of Class

This course is intended for students without any or little background in physics and calculus. Through Newtonian mechanics, important concepts in physics such as force, momentum, energy, angular momentum, and laws of conservation will be introduced. In addition, how these concepts are described in the language of mathematical equations, in particular, using calculus will be explored.

3. Goal of Study

By the end of the course, you are expected to gain familiarity with Newton's laws of motion, momentum, and energy, and angular momentum as well as their conservation properties. In addition, you are expected to be able to draw a free-body diagram, derive an equation of motion, and solve it using simple vector algebra and calculus.

4. Contents and Progress Schedule

Schedule of the course:

0. Orientation to WileyPlus + ORION system and the course survey

1. Introduction and Ch1: Measurement (unit)

2. Ch2. Motion Along a straight line (acceleration and free fall)

3. Ch3. Vectors

4. Ch4: Motion in Two and Three Dimensions (Projectile motion under uniform gravity)

5. Ch4. Motion in Two and Three Dimensions (Uniform circular motion, and relative motion)

6. Ch5: Force and Motion I(Newton's law of motion)

7. Ch5 and Ch6: Force and Motion I & II (free body diagram, frictional force, and centripetal force)

Midterm examination (Ch1-Ch6)

8. Ch7: Kinetic Energy (transformation and transfer of energy, work, work done by gravity, work done by spring, and power)

9. Ch7: Kinetic Energy (transformation and transfer of energy, work, work done by gravity, work done by spring, and power)

10. Ch8: Potential Energy (isolated system, conservation of energy, conservative force and potential energy)

11. Ch9: Center of Mass (a system of particles, center of mass, conservation of total momentum of a system)

12. Ch10: Rotation (correspondance between linear and angular motion, moment of inertia, angular momentum)

13. Review and course survey

Final examination (Lecture 7-10)

5. Evaluation Method

Evaluation will be based on a midterm exam (25%), final exam (25%), homework assignments (20%), attendance (10 %), reading assignment and self-practice with ORION system (20%).

6. Textbook and References

Fundamentals of Physics Extended, 10th Edition David Halliday, Robert Resnick, Jearl Walker Wiley 2013 textbook

7. URL

<https://www.wileyplus.com/>

8. Preparation and Review

This course requires purchase of the WileyPlus system which costs \$40 USD. The system includes an electronic version of the required textbook with many integrated features to facilitate understanding of the subjects and problem solving skill in physics. The system also comes with a self-diagnostic tool, ORION, with which one will practice problem solving based on his/her own proficiency in each chapter that will be covered in the course. Access to internet is necessary outside of the class. Registration to the WileyPlus and payment method will be announced in the orientation in the first lecture.

9. Practical business

10. Students must bring their own computers to class 不要

11. In Addition

If you are planning to take Physics B or/and C, you must register for another Physics A (ZDN-PHY111E), which is targeted for chemistry and engineering majors with highschool-level physics and calculus background. Survey of conceptual understanding of the subject will be conducted at the first and last lecture to assess the effectiveness of the instructional method.

<4> Physics A

Class Schedule: Friday, 4th. (2 credits) Category: Expansion Subjects-Physics

Course Code: CB54206 Instructors: Takeshi KOIKE

*This class is open for AMC and IMAC-U students only.

1. Class Subject Classical Mechanics

2. Object and Summary of Class

This is an introductory course to Newtonian mechanics, but also serves as an introduction to the way we try to understand various natural phenomena encountered in Physics B (oscillations and waves, fluid dynamics) and Physics C (electromagnetism). Mechanics deals with motion of a physical body as well as response to forces applied to the body. The mechanics we study in this course is applicable to an object or system of particles that is slow moving in comparison to the speed of light (non relativistic) and large enough in physical scale as to be unaffected by quantum fluctuations, hence the name "classical".

3. Goal of Study

By the end of the course, you are expected to gain familiarity with and obtain basic understandings of Newton's laws, work and energy, conservation of energy, linear momentum, and angular momentum, systems of particles, rotations, and Newton's law of gravitation with Kepler's law of planetary motions.

4. Contents and Progress Schedule

Schedule of the course:

0. Orientation to WileyPlus + ORION system and the course survey
1. Ch3: Vectors (General introduction to physics, scalar vs vector, addition, dot and cross product, unit vector, and vector and calculus)
2. Ch4: Motion in Two and Three Dimensions (Projectile motion under uniform gravity, uniform circular motion, and relative motion)
3. Ch5: Force and Motion I (Newton's law of motion, its applicability, Galilean relativity, inertial frame, force and rate of change of linear momentum, and conservation of momentum)
4. Ch6: Force and Motion II (free body diagram, frictional force, drag force (viscous and inertial), and centripetal force)
5. Ch7: Kinetic Energy (transformation and transfer of energy, work, work done by gravity, work done by spring, and power)
6. Ch8: Potential Energy (isolated system, conservation of energy, conservative force and potential energy)
7. Ch9: Center of Mass (a system of particles, center of mass, conservation of total momentum of a system, and reduced mass of two body system)

Midterm (Lecture 2-6)

8. Ch9: Collision (impulse, elastic and inelastic collision, and rocket equation)

9. Ch10: Rotation (correspondance between linear and angular motion, moment of inertia, parallel and orthogonal axis theorem, center of mass and gravity)

10. Ch11: Rolling, Torque, and Angular Momentum (rigid body, torque as a rate of change of angular momentum, torque in the center of mass frame, rolling on an inclined plane)

11. Ch11 (rolling on a flat surface, physics of tops, precession, and gyroscopic effect)

12. Ch13: Gravitation (central force, effective potential, constant of motion, Kepler's law of planetary motion)

13. Ch13: Gravitation (gravity near the earth surface, gravitational potential) and Course survey

Final examination (Lecture 7-13)

5. Evaluation Method

Evaluation will be based on a midterm exam (30%), final exam (30%), homework assignments (20%), reading assignment and self-practice with ORION system (20%).

6. Textbook and References

Fundamentals of Physics Extended, 10th Edition David Halliday, Robert Resnick, Jearl Walker Wiley 2013 textbook

7. URL <https://www.wileyplus.com/>

8. Preparation and Review

This course requires purchase of the WileyPlus system which costs \$40 USD. The system includes an electronic version of the required textbook with many integrated features to facilitate understanding of the subjects and problem solving skill in physics. The system also comes with a self-diagnostic tool, ORION, with which one will practice problem solving based on his/her own proficiency in each chapter that will be covered in the course. Access to internet is necessary outside of the class. Registration to the WileyPlus and payment method will be announced in the orientation in the first lecture.

9. Students must bring their own computers to class 不要

10. In Addition

For those planning to take Physics B or/and C, the WileyPlus account that is purchased in this course will be reserved, and no additional payment is necessary. Survey of conceptual understanding of the subject will be conducted at the first and last lecture to assess the effectiveness of the instructional method.

<5> Life and Nature

Class Schedule: Tuesday, 2nd. (2 credits) Category: Core Subjects-Science Studies

Course Code: CB22261 Instructors: Yumiko WATANABE, etc.

1. Class Subject

Life & Nature: Study of Nature, Life, and Technology

2. Object and Summary of Class

This course aim to provide an overview of the natural processes that occurred over 13.7 billion years. In this year the course would focus on the topic, "Dynamics of the Earth" taught by instructors from School of Science, etc. An important ambition is to help students in various fields appreciate the importance, interdependence and connections between physical, chemical, biological, and social sciences. The course will provide a broad perspective about the fantastic growth in complexity in the universe and on the Earth throughout their history.

3. Goal of Study

In this course, the student will gain a broad perspective about natural and living systems, their basic constituents and properties. The student will also better understand how natural and living systems consist of complex networks of elements whose intricate and dynamical balance is critical for our planet and all its inhabitants, the ultimate global ecosystem.

4. Contents and Progress Schedule

The detailed class schedule will be announce in a timely manner in the future.

5. Evaluation Method

Evaluation will be based on weekly attendance (30%) and active participation in discussion sessions (20%), homework assignments & reports (50%).

6. Textbook and References

Big History: Between Nothing and Everything David Christian et al. McGraw-Hill Education 2013

Big Hisotry of Everything David Chrstian 2019

7. URL

1. Big History Project web site:

<https://school.bighistoryproject.com/bhplive>

2. Cosmic evolution. Eric J. Chaisson (2013)

https://www.cfa.harvard.edu/~ejchaisson/cosmic_evolution/docs/splash.html

3. The History of Earth:

<https://www.youtube.com/watch?v=pN7VQas4OgQ>

4. Cosmology Today:

<https://www.youtube.com/watch?v=xyhZcEY5PCQ>

8. Preparation and Review

Students will be expected to spend about 1-2 hours per week, on average, reviewing video and doing assignments.

9. Practical business

10. Students must bring their own computers to class yes

11. In Addition

1) This is a required course for all first-year FGL program students, and also is open to all students. Japanese students and exchange students may be enrolled.

2) Classes may be given remotely with different styles like "on demand", "interactive online session" using a different type of platform, such as Zoom, Meet. Many classes are taught by instructors from Dept. of Geosciences.

<6> Biology A

Class Schedule: Monday, 2nd. (2 credits)

Category: Expansion Subjects-Biology

Course Code: CB12259 Instructors: Yasukazu DAIGAKU, etc.

1. Class Subject Biology A

2. Object and Summary of Class

Cells are the structural and functional units of living organisms. Understanding basics of cell biology is essential for studying all areas of life sciences and any related branches of natural sciences. The main objective of this course is to learn the essential principles of cell biology by learning how the living cells are made and operated from a molecular perspective: especially, how DNA, RNA and proteins cooperatively work inside the cells to allow the maintenance, replication and responses to stimuli. This course particularly emphasizes the storage and utilization of genetic information in cells through the processes, "the central dogma".

3. Goal of Study

Upon finishing this course, students will have a solid grasp of cell structure and molecular dynamics during DNA replication and repair, gene expression, and cellular communication. To accomplish this goal, students need to understand the basic of cellular components, chemical reactions, and information processing mechanisms, and signaling systems. In addition, by applying the concept of cell biology, students will learn more about living organisms including humans and will have a glimpse of cutting-edge sciences.

Some of the specific learning objectives include:

- Understand fundamental roles of cells in living systems
- Realize the importance of studying cells in order to understand living organisms, and ecosystems as well as human health and disease.
- Explain the fundamental differences between prokaryotic and eukaryotic cells from both a structural and evolutionary perspective
- Understand the function of the main cellular and genetic components, how they are connected to the living process
- Describe the basic mechanisms involved in DNA replication and repair, gene expression (transcription and translation)
- Explain the basic idea of gene and genome evolution
- Understand principles of cell signaling and information processing
- Understand the system of cell communities by integrating cellular and molecular processes

To achieve this, students will complete weekly reading and problem-set assignments. Quizzes and in-class exercises, and an online forum will be used to promote co-learning and interactions between students. In addition, a final examination will be used to evaluate student learning and ability to extend what they learned in novel contexts.

4. Contents and Progress Schedule

- 1) Introduction
- 2) Cells as the fundamental units of life
- 3) Chemical components of cells
- 4) Chemical reactions in cells
- 5) DNA and chromosomes (structure and function)
- 6) DNA replication, repair, and recombination
- 7) From DNA to RNA (transcription and RNA processing)
- 8) From RNA to proteins (translation and protein synthesis)
- 9) Control of gene expression 1 (transcriptional mechanisms)
- 10) Control of gene expression 2 (post-transcriptional controls)
- 11) Gene and genome evolution
- 12) Cell signaling 1 (principles and concepts)
- 13) Cell signaling 2 (receptors and cell-cell communication)
- 14) Cell communities (tissue, stem cells, and cancer) + Exam information
- 15) Final examination

5. Evaluation Method

Attendance and active participation (30%), homework assignments (20%), weekly in-class quizzes, exercises and mini-presentation (20%), examinations (30%).

6. Textbook and References

Essential Cell Biology, 5th Edition Alberts B, Hopkin K, Johnson A, Morgan D, Raff M, Roberts K, Walter P WW Norton & Co 2018

7. Preparation and Review

Students are expected to spend 2-3 hours per week, reading relevant textbook material, preparing for the class and completing online assignments.

8. Students must bring their own computers to class Yes

('zoom' have to be installed for on-line leecture)

9. In Addition

- 1) This is a general, entry-level biology course, open to all students and compulsory for first-year FGL students in the AMB program. High school-level familiarity with basic organic chemistry and biology is expected, but not necessarily. Japanese students and exchange students from any field of study are encouraged to enroll, knowing that this is an introductory course held in English.
- 2) Essential Cell Biology (4th or 5th Edition) is the main reference textbook.
- 3) Instructors are available for questions and consultation upon appointment.

<7> Chemistry A

Class Schedule: Wednesday, 2nd. (2 credits) Category: Expansion Subjects-Chemistry

Course Code: CB32238 Instructors: ZHANPEISOV, Nurbosyn

1. Class Subject

Fundamentals of chemical bond theory

2. Object and Summary of Class

The nature of chemical bond is the fundamental concept to understand the structure and properties of atoms and molecules as well as any molecular substances. One will learn the electronic structure of atoms depending on its position in periodic table of elements, formation of bonds as well as different molecular associations based on quantum chemistry concepts.

3. Goal of Study

One must understand the structure of the atom based on its electronic configuration as well as its relationship with chemical and physical properties of any element. One will learn the concept of wave equation, its application to diatomic molecules and chemical bonds in large molecular associations. Shape or structure of simple polyatomic molecule can be explained via concept on hybridization or hybrid molecular orbital formations as well as relationships between bond length and electronic configuration. One must understand the nature of bonding responsible for stability of molecular associations.

4. Contents and Progress Schedule

第 1 回 Introduction

第 2 回 Classical quantum theory and atomic model

第 3 回 Wave equation and basics of quantum chemistry

第 4 回 Electronic configuration and periodic table of elements

第 5 回 Electronic structure of positively charged molecular hydrogen and diatomics

第 6 回 Hybrid molecular orbital and the shape of the polyatomic molecule

第 7 回 Covalent bond and ionic bond

第 8 回 Mid-term test

第 9 回 Molecular complexes and intermolecular forces

第 10 回 Crystal structure motif and crystal field theory

第 11 回 Approximation methods, Valence-bond (VB) method

第 12 回 Hueckel theory for ethylene, allyl

第 13 回 Hueckel theory for butadiene and trimethylenemethane

第 14 回 Modern quantum chemistry

第 15 回 Term-end test

試験

5. Evaluation Method

Evaluation will be based on class attendance, in class activity and on the

results of term-end test.

6. Textbook and References

Physical Chemistry Ira N. Levine 2008

Physical Chemistry: A Molecular Approach D.A. McQuarrie and J.D. Simon 2011

7. URL

8. Preparation and Review

We will have small and term-end tests. The lecture attendance will be strictly controlled.

9. Practical business

10. Students must bring their own computers to class yes

11. In Addition

<8> Mineralogy, Petrology & Geochemistry

Class Schedule: Monday, 3rd. (2 credits)

Category: Expansion Subjects-Natural Sciences/ Earth and Space Science

Course Code: CB13226 Instructors: ZHANPEISOV, Nurbosyn

1. Class Subject

Fundamentals of crystal structures of solids

2. Object and Summary of Class

The chemical crystallography applied to different kinds of solid structures is an important fundamental concept in many fields of chemistry and physics. One will learn the diversity of oxide, salt, metallic as well as organic solids, the nature and types of ordered structures composed of identical repeating units of a group or large atoms, molecules, ions as well as basic principles of defining crystal structures by physical and theoretical methods.

3. Goal of Study

One must understand different types of solids with crystalline and/or amorphous structures, number of possible chemical bonding (driving force) in solids as well as fundamental energy units to characterize crystalline association. Also, one must understand the structure-property relationship to describe tiny chemical and physical properties of any solid.

4. Contents and Progress Schedule

第1回 Introduction to the chemistry and physics of solids, mineralogy

第2回 Amorphous solid, glass and polymer (biopolymer)

第3回 Chemical bonding in solids, coordination number

第4回 Cohesive energies in solids, formation energy of a unit

第5回 Interatomic distances in crystal structures

第6回 Basic structure motifs of crystalline solids

第7回 Anisotropy and the Avogadro constant

第8回 Magnesium oxide, low coordination ions

第9回 Mid-term test

第10回 Silica and zeolites

第11回 Titanium dioxides (rutile, anatase, brookite)

第12回 Covalent crystals of carbon

第13回 Metals

第14回 Metal-organic frameworks

第15回 Term-end test

試験

5. Evaluation Method

Evaluation will be based on class attendance, reports and on the results of term-end test.

6. Textbook and References

Physical Chemistry R.J. Silbey, R.A. Alberty 2000

7. URL

8. Preparation and Review

We will have small and term-end tests. The lecture attendance will be strictly controlled.

9. Practical business

10. Students must bring their own computers to class yes

11. In Addition

<9> Chemistry B

Class Schedule: Thursday, 4th. (2 credits) Category: Expansion Subjects-Chemistry

Course Code: CB43243 Instructors: ZHANPEISOV, Nurbosyn

1. Class Subject

Fundamentals of physical chemistry

2. Object and Summary of Class

In this course, main emphasize will be given to the fundamentals and concepts that provide a basis for understanding physical chemistry, underline physical principles that govern the properties and behavior of chemical systems. It would be also as a learning basic course by giving a series of lectures on different topics of physical chemistry.

3. Goal of Study

One must understand the fundamental relationships between the structure of a chemical compound and its physical (as well as chemical) properties. One must understand main concepts of state equations, main laws of thermodynamics, reaction equilibrium as well as reaction kinetics.

4. Contents and Progress Schedule

第1回 Quantitative concepts of temperature, work, internal energy and heat

第2回 Classical mechanics and Newton' second law of motion

第3回 First law of thermodynamics

第4回 Barometric formula, van der Waals equation, enthalpy and heat capacity

第5回 Carnot heat engine, the second law of thermodynamics

第6回 Entropy, the third law of thermodynamics, thermodynamic equations of state

第7回 Kinetic theory of gases, model of a perfect gas

第8回 Types of average speeds, collision with a surface

第9回 Mid-term test

第10回 Reaction kinetics and reaction rate equation

第11回 First, second and third order reactions

第12回 Reversible first order reaction, parallel first order reaction

第13回 Consecutive first order reaction, mechanisms of chemical reactions

第14回 Radical reactions, unbranched and branched chain reactions

第15回 Term-end test

試験 1.

5. Evaluation Method

Students must attend all these lectures. Evaluation will be based on class attendance, on the results of short and term-end tests.

6. Textbook and References

Physical Chemistry Ira N. Levine 2008

7. URL

8. Preparation and Review

We will have small and term-end tests. The lecture attendance will be strictly controlled.

9. Practical business

10. Students must bring their own computers to class Yes

11. In Addition

<10> World of Fine Arts

Class Schedule: Thursday, 3rd. (2 credits) Category: Core Subjects-Human Studies

Course Code: CB44209 Instructors: Mitsuru HAGA

1. Class Subject

Japanese Art History

2. Object and Summary of Class

Art shows (and encompasses) the way we comprehend and understand this Universe. Therefore Art should be regarded as a visual philosophy; not as a mere illustration of history based on written documents. Thereupon, the importance of learning its history, in this case, Japanese Art History, can never be exaggerated.

3. Goal of Study

The objective of this course is to provide an outline and basic knowledge about Japanese Art History ranging from the beginnings of human habitation in the Japanese archipelago to the present, including the art of the Jomon, Yayoi, Kofun, Asuka and Nara, Heian, Kamakura, Muromachi, Azuchi-Momoyama, Edo, Meiji, Taisho, Showa and Heisei Periods.

4. Contents and Progress Schedule

1. Course Orientation. What is Art ?
2. Art of Jomon Period
3. Art of Yayoi and Kofun Periods
4. Asuka Hakuou Art~ the Reception of Buddhism
5. Art of Nara Period
6. Art of Heian Period 1
7. Art of Heian Period 2
8. Art of Kamakura Period
9. Art of Nanbokucho/Muromachi Period
10. Art of Momoyama Period
11. Art of Edo Period 1
12. Art of Edo Period 2
13. Art of Meiji Period
14. Art of Taisho, Showa and Heisei Periods (1)
15. Art of Taisho, Showa and Heisei Periods (2)

5. Evaluation Method

Evaluation will be based on final report (70%), performance in the class room (30%).

6. Textbook and References

A History of Japanese Art Noritake TSUDA Tuttle Publishing 2009

7. URL

8. Preparation and Review

The session time is limited and therefore self-directed learning is

important. Students are required to prepare and review for each class.

9. Practical business

10. Students must bring their own computers to class No need.

11. In Addition

<11> Foundations of Calculus

Class Schedule: Tuesday, 4th. (2 credits)

Category: Expansion Subjects-Mathematics

Course Code: CB24255 Instructors: Xavier DAHAN

1. Class Subject

Foundations of Calculus

2. Object and Summary of Class

Built upon Calculus learnt in high-school, this course prepares to more advanced/academic techniques of essential Calculus. Differential and Integral Calculus are the core of this course.

3. Goal of Study

Learn more advanced techniques of differentiation and integration.

Learn applications of differential and integral calculus.

Be confident to use differential and integral calculus in other courses like Physics and Chemistry, Probability and Statistics.

4. Contents and Progress Schedule

1. Review of essential mathematics notions.

2. Review of functions. Trigonometric functions, inverse trigonometric function.

3. Limits. Continuity.

4. Derivative of a function. Differentiation.

5. Derivatives of usual functions. Product, quotient and chain's rules.

6. Mean value theorem. Min/max problems.

7. De L'Hospital's rule. Computations of limits.

8. Mid-term examination.

9. Integration. Definition and Fundamental Theorem of Calculus.

10. Technique of Integration I: substitution

11. Technique of integration II: integration by parts.

12. Technique of integration III: Integration of rational functions.

13. Technique of integration IV: trigonometric integrands and substitutions

14. Length, area, volume, average.

15. Improper integrals.

16. Final examination.

5. Evaluation Method

A mix of midterm, final, and two to three reports, with heavier weight on the final, midterms and reports.

6. Textbook and References

Thomas' Calculus M.-D. Weir, J. Hass PEARSON

7. URL

8. Preparation and Review

Each new topic learnt is accompanied by "practice sheets" that illustrate

and deepen each newly introduced material. A selection of these problems will be solved in class. Two or three reports will be assigned and will serve to prepare to the midterm and final exams.

9. Practical business

10. Students must bring their own computers to class No

11. In Addition

<12> Calculus A

Class Schedule: Friday, 2nd. (2 credits)

Category: Expansion Subjects-Mathematics

Course Code: CB52223

Instructors: Xavier DAHAN

1. Class Subject

Calculus of functions of the real variable

2. Object and Summary of Class

This is a classical first course of calculus for engineering students. It takes root in Calculus learnt in high-school and brings it to a more advanced/college level. The core of the course is differentiation and integration.

3. Goal of Study

Learn fundamental techniques of calculus of functions of the real variable, especially differentiation and integration.

Learn basic and fundamental applications.

Raise calculations skills. Become confident in conducting substantial calculations as met in Physics, Chemistry, Probability and Statistics, Engineering.

4. Contents and Progress Schedule

1. Introduction. Review of elementary functions.

2. Inverse functions (including some inverse trigonometric functions).

3. Limit of a sequence of numbers, definition and properties of real numbers.

4. Limit of a function and continuity. Intermediate value theorem.

5. Definition of the derivative of a function, differentiability.

6. Calculations of derivatives. Mean value theorem and applications to extrema problems

7. De L'Hospital's rule and practical evaluation of limits.

8. Midterm examination

9. Taylor's expansions, practical calculation.

10. Taylor-Lagrange remainder, application to estimation of the error.

Definition of the Riemann integral and the fundamental theorem of calculus.

11. Antiderivatives of elementary functions.

Technique of integration I-II: substitution and integration by parts.

12. Technique of integration III: integration of partial rational functions.

13. Technique of integration IV: trigonometric integrands and substitution

14. Area, volume, length.

15. Improper integrals

16. Final examination

5. Evaluation Method

A mix of the final and midterm exams, and reports.

6. Textbook and References

Shaum's outline. Calculus (sixth edition) Frank ayres. Elliott MEndelson
McGraw Hill

7. URL

8. Preparation and Review

Each new topic learnt is accompanied by "practice sheets" that illustrate and deepen each newly introduced material. A selection of these problems will be solved in class. Two to three reports will be assigned and serve to prepare the midterm and final exams.

9. Practical business

10. Students must bring their own computers to class No

11. In Addition

<13> Linear Algebra A

Class Schedule: Tuesday, 3rd. (2 credits)

Category: Expansion Subjects-Mathematics

Course Code: CB23253

Instructors: Marcin SCHROEDER

1. Class Subject

Linear Algebra A

2. Object and Summary of Class

This is the first of the series of two courses in linear algebra.

The course is introducing students into the main topics of linear algebra at the level of abstraction of vector spaces over arbitrary field K , but with the focus on real and complex field and with a frequent assumption of finite dimension of vector spaces.

3. Goal of Study

The course has three main educational objectives:

- to provide students with a good understanding of linear algebra
- to develop in students proper skills of mathematical thinking in solving problems
- to prepare students for their own future study whenever they will need an expansion of their mathematical knowledge

4. Contents and Progress Schedule

Weekly schedule of topics:

- Preliminary knowledge of high school level of mathematics necessary for the course; The fields of Real and Complex numbers
- Vector Space
- Coordinatization of Vector Spaces
- Matrices
- Applications of Matrices; Systems of Linear Equations
- Elementary Matrices; Rank of a Matrix
- Linear Mappings
- Change of Bases; Intro to Inner Product Spaces
- Inner Product Spaces
- From Scalar Product to Quadratic Forms, to Determinants
- Symmetric and Hermitian Operators
- Unitary Operators; Intro to Eigenvalues and Eigenvectors
- Characteristic Polynomials
- Diagonalization and Spectral Theorems
- Comprehensive Examination

5. Evaluation Method

50% Homework

50% Final Examination

6. Textbook and References

Linear Algebra 3rd ed Serg Lang Springer 2004

7. URL

8. Preparation and Review

Frequent homework assignments with problems to be solved and with material for the preparation to the next class

9. Practical business

10. Students must bring their own computers to class No

11. In Addition

Students will receive frequent materials for the study prepared by the instructor.

<14> Basic Japanese 1

Class Schedule: Monday, 4th/Tuesday, 5th/ Thursday, 2nd/Friday 3rd. (4 credits)

Category: Common Subjects-Subjects for International Students

Course Code: CB42215 Instructors: Natue SUGAYA, Atsuko UCHIYAMA, Masako HAYASHI

1. Class Subject

Japanese for beginners

2. Object and Summary of Class

This class will use Google Classroom.

Intended for students who will study Japanese for the first time. This class aims to help students acquire basic knowledge of Japanese language and enhance the four skills of speaking, listening, reading, and writing.

3. Goal of Study

Students will

- master elementary Japanese grammar, vocabulary, kana (hiragana, katakana) and approximately 150 basic kanji
- acquire minimum skills in speaking, listening, reading and writing for essential everyday situations
- achieve a proficiency level equivalent to JLPT N5.

4. Contents and Progress Schedule

1. Course orientation, Kana quiz
- 2-5. Lesson 1 New Friends
- 6-9. Lesson 2 Shopping
- 10-13. Lesson 3 Making a Date
- 14-18. Lesson 4 The First Date
- 19-23. Lesson 5 A Trip to Okinawa
- 24-28. Lesson 6 A Day in Robert's Life
29. Midterm exam (Kanji, Grammar, Listening)
30. Midterm exam (Speaking)
- 31-34. Lesson 7 Family Picture
- 35-39. Lesson 8 Barbecue
- 40-44. Lesson 9 Kabuki
- 45-49. Lesson 10 Winter Vacation Plans
- 50-54. Lesson 11 After the Vacation
- 55-58. Lesson 12 Feeling Ill
- 59-60 Summary

5. Evaluation Method

Homework assignments and class participation 50%, Quizzes 10%, Midterm and final exams 40%

6. Textbook and References

Genki 1, 3rd edition Banno et al. The Japan Times 2020 Textbook

7. URL

Genki-Online <https://genki3.japantimes.co.jp/>
The Japan Times, Book Club
<https://bookclub.japantimes.co.jp/en/book/b497763.html>

8. Preparation and Review

(1) Those who have no knowledge of the Japanese characters (hiragana, katakana) should learn them as a prerequisite to joining the program by using prescribed materials.

(2) During the course we expect you to:

1. Submit all homework assignments by due dates. Late work will be marked lower.
2. Prepare for the lessons: Listen audio materials and learn vocabulary in advance. Read the grammar explanations in advance.

9. Practical business

10. Students must bring their own computers to class 必要
Yes

11. In Addition

Students are required to purchase the THIRD edition of GENKI 1.

<15> An Introduction to Information Science B

Class Schedule: Monday, 1st. (2 credits)

Category: Common Subjects--Information Sciences

Course Code: CB11257 Instructors: Xavier DAHAN

1. Class Subject

Information Science Basics B

2. Object and Summary of Class

Successful course participants will learn to utilize the information technology for intellectual and productive activities, to find ways to solve problems logically in terms of computer science, to handle big data and statistics appropriately in the data-driven society, and to raise awareness about the modern issues of science and technology in the information society as a responsible citizen.

3. Goal of Study

Successful course participants will learn to utilize the information technology for intellectual and productive activities, to find ways to solve problems logically in terms of computer science, to handle big data and statistics appropriately in the data-driven society, and to raise awareness about the modern issues of science and technology in the information society as a responsible citizen.

4. Contents and Progress Schedule

1. Orientation
2. Introduction
Basics usage of information systems and cyber security issues
3. Academic skill I
Basics of intellectual production assisted by information technology (part 1)
4. Academic skill I
Basics of intellectual production assisted by information technology (part 2)
5. Academic skill I
Basics of intellectual production assisted by information technology (part 3)
6. Social skill
Responsibility in the information society (part 1)
7. Social skill
Responsibility in the information society (part 2)
8. Academic skill II
Computational thinking (part 1)
9. Academic skill II
Computational thinking (part 2)
10. Academic skill II

Computational thinking (part 3)

11. Academic skill II

Computational thinking (part 4)

12. Academic skill III

Data literacy (part 1)

13. Academic skill III

Data literacy (part 2)

14. Academic skill III

Data literacy (part 3)

15. Academic skill III

Data literacy (part 4)

5. Evaluation Method

Final homework assignments: 80%

Participation in class: 20%

6. Textbook and References

コンピュータショナル・シンキング 磯辺秀司, 小泉英介, 静谷啓樹, 早川美徳 共立出版 2016
情報倫理ケーススタディ 静谷啓樹 サイエンス社 2008

7. URL

8. Preparation and Review

Homework assignments are given during semester.

In particular, writing documents and making presentation slides with computers will be required in the part of Academic skill I.

For Academic skill II and III, computer programming will be assigned.

9. Practical business

10. Students must bring their own computers to class No

11. In Addition