# Introductory Review on Economics

<table>
<tr><td>School/ department</td><td colspan="2">Economics</td><td>Classroom (and building)</td><td>Economics, Seminar Room 5</td></tr>
<tr><td colspan="2">Day/Period</td><td colspan="3">Monday, 5th period (16:30 – 18:00) First lecture: October 15th .</td></tr>
<tr><td colspan="2">Course content: basic/advanced (year students take it)</td><td colspan="3">Basic, 1st-year students.</td></tr>
<tr><td colspan="2">Lecturer (担当)</td><td colspan="3" rowspan="4">Maria MARTIN-RODRIGUEZ<br>mmartin@soec.nagoya-u.ac.jp</td></tr>
<tr><td rowspan="3">Contact</td><td>Office</td></tr>
<tr><td>Phone</td></tr>
<tr><td>E-mail</td></tr>
<tr><td colspan="2">Welcome message</td><td colspan="3">For each question, we begin with a historical or current problem, even if it is a complex one, and then we use models to illuminate it. Students should read the material in advance to follow the discussion in class.<br>This course has been already implemented in UCL, Toulouse School of Economics, Cornell University and University of Sidney, among others.<br>Feel free to join us if you want to learn Economics from a modern perspective that takes the last three decades into account!</td></tr>
<tr><td colspan="2">Any prerequisites/ expectations from the JP students</td><td colspan="3">Interest in understanding economic phenomena.</td></tr>
</table>

**Detailed course content:**

The Capitalist Revolution I. (October 15th)
The Capitalist Revolution II. (October 16th)
Technology, Population and Growth I. (October 22nd)
Technology, Population and Growth II. (October 23rd)
Scarcity, Work and Choice I. (October 29th)
Scarcity, Work and Choice II. (October 30th)
Social Interactions I. (November 5th)
Social Interactions II. (November 12th)
Property and Power: Mutual Gains and Conflict. (November 19th)
The Firm: Owners, Managers, and Employees. (November 26th)
The Firm and its Customers. (November 29th)
Supply and Demand: Price-Taking and Competitive Markets. (December 3rd)
The Labor Market: Wages, Profits, and Unemployment. (January 8th)
Banks, Money, and the Credit Market. (January 21st)
Final exam. (January 28th)

**Course teaching style (lectures with discussions, discussions, team work, etc.)**

Students should read the material in advance to follow the class discussion, which will be focused on the most technical points.

**Course homework assignments:**

Weekly assignments of five questions each turned in through the app Polleverywhere.

**Course examinations (if registered officially and taking the course for credit):**
There is only one final exam at the end of the semester, January 28th, in which students would be required to solve several analytical questions closely related to the models discussed in class.

**Grading of the course (if registered officially and taking the course for credit):**
Weekly problem sets: 60%
Final exam: 40%

**Course syllabus online:**
**Course website or other online presence (if applicable):**

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|---|---|
| **Textbook** | All the materials are available for free at https://www.core-econ.org/ |

# Physical Chemistry I

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|---|---|---|---|
| **School/ department** | Science/Chemistry | **Class room (and building)** | A407 |
| **Day/Period** | Thu, Period 1 | | |
| **Course content: basic/advanced (year students take it)** | Intermediate | | |
| **Lecturer (担当)** | Peter Butko | | |
| **Contact** — **Office** | Science & Agriculture Bldg. 318-1 | | |
| **Contact** — **Phone** | 789-2480 | | |
| **Contact** — **E-mail** | pbutko@chem.nagoya-u.ac.jp | | |
| **Welcome message** | Welcome to the course, in which we will uncover the basic physical laws and forces that underlie properties and behaviors of substances in the form of large ensembles of molecules. We will study and analyze examples from the crossroads between physics, chemistry and biology. In addition, working knowledge of calculus is useful—and expected. Please, be prepared for weekly homework, two exams during the semester, and the comprehensive final at the end. The course may not be very easy, but I am confident that you will find it intellectually rewarding. | | |
| **Any prerequisites/ expectations from the JP students** | Fundamentals of Chemistry I and II | | |

**Detailed course content:**
**(If possible provide class dates and 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 Law 1 (Ch. 3)
7 The Second Law 2 (Ch. 3)
8 The 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)**

**Course teaching style (lectures with discussions, discussions, team work, etc.)**
Lectures with occasional discussions.
**Course homework assignments:** At least 3 problems are assigned each week.

**Course examinations (if registered officially and taking the course for credit):**
Two exams during the semester (for tentative schedule see Detailed Course Content above) and a comprehensive final exam on Jan. 31.

**Grading of the course (if registered officially and taking the course for credit):**
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).

# Fundamentals of Earth Science I

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|---|---|---|---|
| **School/ department** | Dept. of Earth and Planetary Sciences | **Class room (and building)** | A15 |
| **Day/Period** | Mon, 4th period | | |
| **Course content: basic/advanced (year students take it)** | Basic (1st year) | | |
| **Lecturer (担当)** | HUMBLET Marc Andre | | |
| **Contact** — **Office** / **Phone** / **E-mail** | Office: Graduate School of Environmental Studies<br>Department of Earth and Planetary Sciences E516<br>Phone: 052-789-3037<br>Email: humblet.marc@f.mbox.nagoya-u.ac.jp | | |
| **Welcome message** | I welcome all students with various backgrounds and from different academic fields to take this course and I look forward to sharing my interest for the Earth Sciences with them. | | |
| **Any prerequisites/ expectations from the JP students** | None | | |

**Detailed course content:**

1. Earth Sciences: an introduction
2. The solar system
3. Plate tectonics
4. Minerals: rock's elementary building blocks
5. Rocks and rock cycle I: igneous rocks
6. Rocks and rock cycle II: sedimentary rocks
7. Rocks and rock cycle III: metamorphic rocks
8. The age of rocks
9. Earth history I: paleogeography
10. Earth history II: origin and evolution of life

**Course teaching style**
Lecture-based

**Course homework assignments:**
None

**Course examinations (if registered officially and taking the course for credit):**
**(Describe course examination practices; if possible provide the dates for the exams)**
Written examinations (multiple choice quizzes, short answer questions)

**Grading of the course (if registered officially and taking the course for credit):**
Four quizzes (each 25% of total grade)

**Course syllabus online:** course notes and slides available from NUCT course account
**Course website or other online presence (if applicable):**

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|---|---|
| **Textbook** | *Understanding Earth* by John Grotzinger & Tom Jordan |

# Fundamentals of Physics I

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|---|---|---|---|
| **Registration Code** | 0062211 | **Credits** | 2.0 |
| **Course Category** | Sciences Basic | | |
| **Term (Semester) / Day / Period** | G-I (1st year, Fall Quarter 1) / Tue., Thu. / 2 （10:30～12:00） | | |
| **Instructor** | FOONG See Kit | | |
| **Contact** | Office: ES420 Phone: (052)789-2861<br>E-mail: skfoong@eken.phys.nagoya-u.ac.jp | | |
| **Target Schools (Programs)** | Sc(P・C・B)・En(P・C・Au)・Ag(B) | | |

**●Aim of the course**

Fundamentals of Physics I (FP I) is the first of four lecture courses (FP I-IV) designed to cover the basic classical physics to provide a firm foundation for learning science and engineering. This course introduces the concepts and laws of classical mechanics. Further topics in mechanics will be covered in FP II.

**●Prerequisites**

Students without a good background in high school physics and basic calculus are advised to review those materials as soon as possible and would be expected to spend more time and effort for the course. This must be considered when deciding your course load. Students are expected to participate actively in class activities throughout the course.

**●Course contents**

The topics include kinematics, vectors, force and motion, energy, work and momentum, and are based on the following chapters in the textbook:

Chapter 2: Motion Along a Straight Line
Chapter 3: Vector
Chapter 4: Motion in Two and Three Dimensions
Chapter 5: Force and Motion I
Chapter 6: Force and Motion II
Chapter 7: Kinetic Energy and Work
Chapter 8: Potential Energy and Conservation of Energ
Chapter 9: Center of Mass and Linear Momentum

Examples of problem solving will be discussed in lectures, but the companion course - Fundamental Physics Tutorial Ia - is designed to develop students' problem solving skills.

**●Evaluation methods**

Class participation: 10% Lecture Assignment: 10% Mid-Term Exam: 30% Final Exam: 50%

Class attendance is required. Absentee must give a valid reason supported by documents. The ABSENT grade will be assigned when a) your attendance is below 75%, OR b) you are absent without valid reason from the Mid-Term Exam or Final Exam., OR c) you wish to receive the ABSENT grade (In this case, you must see the instructor immediately after the Final Exam.) Note: Students who receive the ABSENT grade for the course are not qualified to take the Repeat Exam.

**●Notice for students**

Concurrent registration of Fundamental Physics Tutorial Ia is strongly advised because it is necessary for mastering the content of the lectures.

| | |
|---|---|
| **Textbook** | Principles of Physics, Extended 9th or 10th Edition International Student Version with WileyPLUS Set (John Wiley & Sons), ISBN (9th Ed): 9780470561584; ISBN(10th Ed): 9781118230749 |
| **Reference Book** | 1.The physics of everyday phenomena, a conceptual introduction to physics by W.T.Griffith and J.W. Brosing (McGraw-Hill, 8th Ed 2014)<br>2.Force + Motion, an illustrated guide to Newton's laws by Jason Zimba (John Hopkins University Press, 2009)<br>3. Fundamentals of Physics 8/E Student Solutions Manual by J. R. Christman (Wiley, 2008)<br>4. Feynman Lectures On Physics (Vol.1) by Richard P. Feynman (Pearson PTR) |

# Genetics 1

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|---|---|---|---|
| **School/ department** | Science/ Biology | **Class room (and building)** | A 407 |
| **Day/Period** | Thursday 2nd period (10:30-12h) | | |
| **Course content: basic/advanced (year students take it)** | advanced (2nd years) | | |
| **Lecturer (担当)** | Maria Vassileva | | |
| **Contact** – **Office** | Science building E room 202 | | |
| **Contact** – **Phone** | ext. 3530 | | |
| **Contact** – **E-mail** | mnvassileva@bio.nagoya-u.ac.jp | | |
| **Welcome message** | Genetics 1 is the beginning of series of courses on Genetics. This course will give students a solid understanding of fundamental processes in genetics. | | |
| **Any prerequisites/ expectations from the JP students** | basic knowledge of Biology/ Genetics | | |

**Detailed course content:**
DNA and RNA structure
Chromatin and nucleosome
DNA replication
DNA mutability and repair
Homologous recombination
Site-specific recombination

**Course teaching style (lectures with discussions, discussions, team work, etc.)**
Lecture course with significant amount of in-class discussion to assure students understanding of the topic

**Course homework assignments:**
Weekly written assignments, to help students study the course content in advance and prepare for class
Once in the semester – presentation on a scientific paper

**Course examinations (if registered officially and taking the course for credit):**
Two exams – midterm and final, written exams with questions concerning the studied content

**Grading of the course (if registered officially and taking the course for credit):**
Exams 60% of grade, weekly assignments 20% of grade, paper presentation 10%, participation in class 10%

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| **Textbook** | Molecular Biology of the Gene, Watson et al., Pearson |

# Special Mathematics Lecture
# (Differential Geometry)

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|---|---|---|---|
| **School/ department** | Mathematics | **Class room (and building)** | 207, Sci. Build. A |
| **Day/Period** | Wed. / 6（18:15～19:45） | | |
| **Course content: basic/advanced (year students take it)** | From 2nd to 4th year, rather advanced but still accessible | | |
| **Lecturer (担当)** | Serge RICHARD | | |
| **Contact** | Office: Room 237, Science Building A<br>E-mail: richard@math.nagoya-u.ac.jp<br>Website: http://www.math.nagoya-u.ac.jp/~richard/SMLfall2018.html | | |
| **Welcome message** | Come and see: learning mathematics in English is pleasant and easy! | | |
| **Any prerequisites/ expectations from the JP students** | Basics courses of calculus and linear algebra | | |

**Aim of the course:**
Differential geometry plays a central role in many physical theory, as for example in classical mechanics, in solid states physics or in general relativity. During this one semester course, many essential notions will be introduced, among them the definitions of a manifold, of the curvature, of the parallel transport, of the holonomy, etc. Depending on the interest of the audience, applications in one of the mentioned theory will be proposed.

**Course Content (provisional)**
1. Manifolds and submanifolds, Riemannian manifolds, 2. Connections, parallel transport, 3. Geodesics
4. Curvature, 5. Homology theory

**Dates:**
October 3, 10, 17, 24, 31, November 7, 14, 21, 28, December 12, 19, January 9, 16, 23

**Course teaching style:**
Regular lectures but with lots of interaction with the students.

**Course examinations:**
There will be no examination for this course.

**Grading of the course:**
The final grade will be determined by the active participation during the lectures (as explained during the first lecture). This course in an optional subject which does not count towards the number of credits required for graduation in any program at Nagoya University.

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| **Textbook** | Material available on the website of the course. |

# Biochemistry 1

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|---|---|---|---|
| **School/ department** | science/biology | **Class room (and building)** | A407 |
| **Day/Period** | Mon/1st | | |
| **Course content: basic/advanced (year students take it)** | basic/ 2nd year | | |
| **Lecturer (担当)** | Young-Jai You | | |
| **Contact** — **Office** | SS508 | | |
| **Contact** — **Phone** | 052-747-6923 | | |
| **Contact** — **E-mail** | yjyou@bio.nagoya-u.ac.jp | | |
| **Welcome message** | Welcome to Biochemistry I class! | | |
| **Any prerequisites/ expectations from the JP students** | N/A | | |

**Detailed course content:**

| Month | Day | Topic |
|---|---|---|
| 10 | 2 | Introduction: What does chemistry do with biology? |
| | 9 | Thermodynamics |
| | 16 | Water: Physical & chemical properties of water. |
| | 23 | Amino Acids |
| | 30 | Proteins: 2D structures |
| 11 | 6 | Proteins: 3D structures |
| | 13 | Review session |
| | 20 | **EXAM** |
| | 27 | Proteins in action: Hemoglobin |
| 12 | 4 | Tools to study protein functions |
| | 11 | Protein function: enzyme I |
| | 18 | Protein function: enzyme II |
| | 25 | Nucleic acids |
| 1 | 8 | Nucleic acids: tools to understand |
| | 15 | Review session |
| | 22 | **EXAM** |

**Course teaching style (lectures with discussions, discussions, team work, etc.)**
Lectures with discussions, team work, paper reading and discussions
**Course homework assignments:**
There will be medium load of homework mostly of problem solving.
**Course examinations (if registered officially and taking the course for credit):**
Midterm exam: Nov. 20; Final exam: Jan 22
**Grading of the course (if registered officially and taking the course for credit):**
Midterm and final exam each 40%; Participation 20%

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| **Textbook** | Principles of Biochemistry Voet & Voet the 4th edition<br>Lehninger Principles of Biochemistry, the 7th edition<br>Biochemistry Stryer, the 8th edition |

# 5109 NEW PERSPECTIVES ON MODERN JAPAN

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|---|---|---|---|
| **School/ department** | Humanities | **Class room (and building)** | Humanities 131 |
| **Day/Period** | Fri, 1st period (8:45~10:15) 10/5~ | | |
| **Course content: basic/advanced (year students take it)** | Advanced, discussion-based seminar for undergraduate 3rd-year students | | |
| **Lecturer (担当)** | Nathan HOPSON<br>nathan.hopson@nagoya-u.jp | | |
| **Contact** — **Office** / **Phone** / **E-mail** | | | |
| **Welcome message** | This is a topical seminar introducing some of the most important themes and works in the Anglophone scholarly literature in recent decades on the social and socioeconomic history of modern Japan. Topics include: nation and nationalisms, gender and domesticity, the body, moral suasion, empire, labor and protest, and nature and the environment. The course is (a) discussion based, and therefore (b) reading intensive.<br><br>If you're interested in gaining new and different perspectives on Japanese history, please join us! | | |
| **Any prerequisites/ expectations from the JP students** | High-school level understanding of modern Japanese history, willingness to participate in discussion | | |

**Detailed course content:**
**(If possible provide class dates and topics)**

1. 10.05 Introduction to the Course
2. 10.12 Nation(s) and Nationalism(s) (1)
3. 10.19 Nation(s) and Nationalism(s) (2)
4. 10.26 Gender and Domesticity (1)
5. 11.02 Gender and Domesticity (2)
6. 11.09 Gender and Domesticity (3)
7. 11.16 Discipline and the Body (1)
8. 11.23 No Class (Labor Day)
9. 12.10 Discipline and the Body (2)
10. 12.17 Labor and Protest
11. 01.11 Empire (1)
12. 01.18 Empire (2)
13. 01.21 Nature and Environment
14. 01.28 TBA
15. 02.04 TBA

**Course teaching style (lectures with discussions, discussions, team work, etc.)**
Discussion. Some sessions student led, depending on enrollment numbers.
Final 1-2 classes reserved for student presentations.

**Course homework assignments:**
Reading, reading responses (6 total for the term, chosen by the individual student)

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| Final project: 3000-word analytical paper or creative project (screenplay, manga, painting, musical composition, YouTube video, collage, photo essay, "museum exhibition," etc., by instructor permission)<br><br>**Course examinations (if registered officially and taking the course for credit):**<br>**(Describe course examination practices; if possible provide the dates for the exams)**<br>No exams<br><br>**Grading of the course (if registered officially and taking the course for credit):**<br>Participation 25%<br>• Minimum Attendance 80%<br>Reading Responses 25%<br>• Upload to NUSS a précis or a PowerPoint summary for at least 6 weeks' readings.<br>Final Paper/Project 50%<br><br>**Course syllabus online:** https://nuss.nagoya-u.ac.jp/s/txHanTcHrFaJL8B<br>**Course website or other online presence (if applicable):** | |
| **Textbook** | N/A (all readings provided online) |

# 1st-year seminar A (Biology and Society)

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|---|---|---|---|
| **School/ department** | ILAS | **Class room (and building)** | C 30 |
| **Day/Period** | Wednesday 2nd period (10:30-12h) | | |
| **Course content: basic/advanced (year students take it)** | basic (1st-year students) | | |
| **Lecturer (担当)** | Maria Vassileva | | |
| **Contact** — **Office** | Science building E room 202 | | |
| **Contact** — **Phone** | ext. 3530 | | |
| **Contact** — **E-mail** | mnvassileva@bio.nagoya-u.ac.jp | | |
| **Welcome message** | This is a discussion- based course, where students research a topic of their interest, present it and discuss their opinions. Join for some fun and free discussions! | | |
| **Any prerequisites/ expectations from the JP students** | none | | |

**Detailed course content:**

Each class has assigned discussion theme, individual topics within the theme are a choice of the students

Biology and Media
Biology and Entertainment
Biology and Sex
Biology and Food
Biology and Health
Biology and Environment
Biology and Physics
Biology and Chemistry
Biology and Engineering
Biology and Arts

**Course teaching style (lectures with discussions, discussions, team work, etc.)**

This course is based on group presentations and in-class discussions.

One more element is reading and reviewing a book (a selection of books is provided, students choose a book of their liking and are able to borrow it for the semester).

**Course homework assignments:**

5 group presentations

**Course examinations (if registered officially and taking the course for credit):**

No exams

**Grading of the course (if registered officially and taking the course for credit):**

Group presentations: 40% of the grade

individual participation in discussions: 40%

Book review: 20 %

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| **Textbook** | none |

<table>
<tr><td colspan="4">Physiology and Anatomy 1</td></tr>
<tr><td colspan="2">School/ department</td><td>Science/ Biology</td><td>Class room (and building) A 408</td></tr>
<tr><td colspan="2">Day/Period</td><td colspan="2">Monday 2nd period (10:30 – 12h)</td></tr>
<tr><td colspan="2">Course content: basic/advanced (year students take it)</td><td colspan="2">advanced (2nd-year)</td></tr>
<tr><td colspan="2">Lecturer (担当)</td><td colspan="2">Maria Vassileva</td></tr>
<tr><td rowspan="3">Contact</td><td>Office</td><td colspan="2">Science building E room 202</td></tr>
<tr><td>Phone</td><td colspan="2">ext. 3530</td></tr>
<tr><td>E-mail</td><td colspan="2">mnvassileva@bio.nagoya-u.ac.jp</td></tr>
<tr><td colspan="2">Welcome message</td><td colspan="2">This course will provide a solid background on how the human body works. The course covers all fundamental organ systems and allows students to make connections between macro-structures and molecular-biology level processes.</td></tr>
<tr><td colspan="2">Any prerequisites/ expectations from the JP students</td><td colspan="2">basic knowledge of biology/ human physiology</td></tr>
<tr><td colspan="4">Detailed course content:<br>Respiratory system, Cardiovascular system, Renal system, Gastrointestinal system, Endocrine system, Reproductive system. Two classes are spent on each organ system.<br>Course teaching style (lectures with discussions, discussions, team work, etc.)<br>This is a lecture course, however it contains significant amount of students participation in form of group discussions<br>Course homework assignments:<br>Six written assignments, for each organ system, in the form of a disease case study.<br><br>Course examinations (if registered officially and taking the course for credit):<br>Two written exams, midterm and final, covering questions from the course content.<br>Grading of the course (if registered officially and taking the course for credit):<br>Exams 70% of grade, case studies 20%, participation in class 10% of grade.</td></tr>
<tr><td colspan="2">Textbook</td><td colspan="2">Several textbooks are useful for this course.<br>The free downloadable OpenStax textbook is the main textbook for the course:<br>OpenStax Anatomy and Physiology (free downloadable)<br>(https://openstaxcollege.org/textbooks/anatomy-and-physiology)<br>Berne and Levy Principles of Physiology (4 ed.), Levy et al.; Saunders (Elsevier)<br>Physiology (5 ed.), Costanzo; Saunders (Elsevier)<br>Netter`s Essential Physiology, Mulroney and Myers; Saunders (Elsevier)<br>Human Physiology (4 ed.), Pocock et al.; Oxford University Press</td></tr>
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<table>
<tr><td colspan="4">Statistical Physics II</td></tr>
<tr><td>School/ department</td><td>Physics Science</td><td>Class room (and building)</td><td>ES035</td></tr>
<tr><td>Day/Period</td><td colspan="3">Friday/5</td></tr>
<tr><td>Course content: basic/advanced (year students take it)</td><td colspan="3">Year 3</td></tr>
<tr><td>Lecturer (担当)</td><td colspan="3" rowspan="2">John WOJDYLO<br>Office: Science Hall 5F 517<br>Email: john.wojdylo@s.phys.nagoya-u.ac.jp</td></tr>
<tr><td>Contact: Office / Phone / E-mail</td></tr>
<tr><td>Welcome message</td><td colspan="3">This unit is the first half of a full-year course. After learning thermodynamics thoroughly – with many examples of systems beyond the ideal gas -- students are introduced to equilibrium statistical mechanics, which describes the equilibrium conditions of systems consisting of a large number of particles. Applications are considered in condensed matter physics, solid state physics, cosmology, chemistry, materials science and biology. Problem-solving is an integral part of the course: students should attend fortnightly tutorials (Physics Tutorial III) where they will discuss many of the assignment questions and receive hints for solutions.</td></tr>
<tr><td>Any prerequisites/ expectations from the JP students</td><td colspan="3">Advanced thermodynamics; introductory statistical mechanics</td></tr>
</table>

**Course Contents**

Callen Chapts 1-8, 15-17, 21 (some parts omitted); Reif Chapts 1-3, 6-7, Appendix A12. Some topics are more fully explored in tutorials. All lectures are recorded on video and are available on Youtube (private channel).

**Lecture 1. Fundamental Relation, Entropy Representation; Postulates of the Entropy.** Partial derivatives and experiments. Thermodynamic coordinates. Existence of the internal energy thermodynamic potential. Existence of an entropy function of state -- proof from within thermodynamics. Basic postulates of thermodynamics. Nernst Postulate (3rd Law of Thermodynamics.) Fundamental relation in the Entropy representation. Based on Callen Chapter 1; and Zemansky and Dittman Chapter 2.

**Lecture 2. Top-Down Approach: Equations of State from the Fundamental Relation.** Examples. Extensive parameters are homogeneous order 1. Intensive parameters are homogeneous order 0. Thermal and Mechanical Equilibrium. Euler relation. Gibbs-Duhem relation. Based on Callen Chapter 2.

**Lecture 3. Bottom Up Approach: Fundamental Relation from the Equations of State.** Mathematical theorems underlying thermodynamics. Examples of applying compatibility condition, Gibbs-Duhem Relation, Euler Relation, 1st Law in molar form. 2nd Equation of State from van der Waals Equation of State. Example: rubber band; photon gas; Fundamental Relation for one-component ideal gas. Ideal gas: "Gibbs Paradox"? Entropy of a mixture: "entropy of mixing". Molar heat capacity and other derivatives. Based on Callen Chapter 3.

**Lecture 4. The Maximum Work Theorem.** Possible and impossible processes. Quasistatic and reversible processes – how can temperature be increased reversibly? Heat flow and coupled systems. The maximum work theorem (proof without using Carnot cycle). Carnot Efficiency. Carnot cycle: why is it necessary? Carnot cycle for a photon gas.

**Lecture 5. Thermodynamic potentials and their physical interpretation.** The Legendre transform. Thermodynamic potentials: internal energy, Helmholtz free energy, Gibbs free energy, enthalpy. Based on Callen Chapter 5.

**Lecture 6. The Extremum Principle in the Legendre Transformed Representations.** Physical meaning of the potentials: a first look. Minimum principles. Applications of thermodynamics. How to measure the entropy. How to liquefy gases -- throttling (Joule-Thompson process). Based on Callen Chapter 6.

**Lecture 7. Maxwell's relations and applications.** Algorithm for reducing thermodynamic derivatives to a combination of easily-measurable quantities. Applications: adiabatic compression; isothermal expansion; free expansion. Based on Callen Chapter 7.

**Lecture 8. Introduction to Statistical Mechanics: the "flavour" of SM.** Intuitive introduction to the SM of "isolated" systems: i.e. entropy representation – microcanonical ensemble (semi-classical treatment). Why are predictions possible at all? Central Limit Theorem. Postulate of equal a priori probability. Importance of the number of accessible states Omega. Some examples of counting Omega: Einstein model of a crystalline solid; the "two-state model" and the Schottky Hump. Entropy and Omega. Equilibrium conditions. Combinatorial methods for counting Omega are usually difficult and of limited use – two ways to overcome this: 1) take advantage of high dimensionality [today]; 2) use Legendre transformed representations [later]. Based on Callen Chapter 15.

**Lecture 9. Basic Facts About the Binomial Distribution.** How a Gaussian emerges from the binomial distribution; mean, variance, standard deviation, etc. Reif Chapter 1. NONEXAMINABLE: Theory of the Classical Microcanonical Ensemble: Gibbs Ensemble; Classical Liouville Theorem; role of symmetry in Statistical Mechanics. Classical microstates. The density function and thermodynamic averages. Classical Ergodic Theorem. (Huang p. 52-54; 62-65; 127-135). The density function is a conserved quantity, therefore it must be expressible as a linear combination of fundamental additive conserved quantities. (Lifshitz and Pitaevski p. 11.)

**Lecture 10. Evolution of an Isolated System to Equilibrium – Entropy.** Why do isolated systems tend to equilibrium; why do

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| systems evolve out of equilibrium states? Why do systems in an ensemble want to occupy each possible state equally; why do probability distributions want to be flat, thus maximizing our ignorance of the system state? Why does entropy increase in a spontaneous process? Why is entropy maximum at equilibrium? Why S=k Log(Omega)? Why S= -k Sum{pr Log pr}? Principle of Detailed Balance; Boltzmann's H-Theorem. (Reif A12.)<br><br>**Lecture 11. Statistical Mechanics in the Helmholtz Representation: Canonical formalism.** Canonical partition function. Boltzmann probability distribution derived for a system in contact with a heat reservoir. Connection with thermodynamics. Weakly-interacting systems: additivity of energies and factorizability of the partition function. Basic examples. (Callen 16-1, 16-2.)<br><br>**Lecture 12. Canonical Partition Function cont'd.** Fluctuations. Adiabatic work. Microscopic effect of work and heat. In equilibrium, energy probability distribution is Gaussian: overwhelming probability that the system is within 1 std dev of the mean. 3rd Law of Thermodynamics. If mean energy of a system is known then the canonical ensemble applies (temperature is fixed). Proof: allow energy of the system to fluctuate and use Method of Lagrange Multipliers to find the MOST PROBABLE probability distribution, which is Boltzmann's distribution. (Reif Chapter 6.)<br><br>**Lecture 13. Paramagnetism.** NONEXAMINABLE: 1st Law of Thermodynamics for Magnetic Systems: role of a pair of intensive and extensive parameters is swapped (Kittel Chapt. 18; Callen Appendix B). EXAMINABLE: We solve the problem of paramagnetism first for spin-1/2 case then for the arbitrary spin case. (Reif p. 206-208; 257-262.)<br><br>**Lecture 14. The Classical Limit via Classical Counting.** Why is our approach classical, even when using energy eigenvalues from QM? What characterizes the classical limit? Example: internal modes of a gas (Callen 16-3). DENSITY OF STATES (important for next semester) (Callen 16-6). The classical density of states (Callen 16-9). How the classical partition function emerges from the semi-classical partition function. Classical ideal gas: equations of state, entropy (Reif 7.2, 7.3 p 239-246). The classical equipartition theorem (Reif 7.5 p 248-250).<br><br>**Lecture 15. 1. Kinetic Theory of Dilute Gases in Equilibrium.** Maxwell velocity distribution. Distribution of a component of velocity. Speed distribution: mean, rms, most probable speeds. (Reif 7.9, 7.10). NONEXAMINABLE: 2. Fundamental Postulates of Quantum Statistical Mechanics: in an isolated system, equal a priori probabilities and the postulate of random phase. The operation of taking a statistical average and quantum average simultaneously: the density operator. Properties of the density operator. Canonical partition function in terms of the density operator. Why the off-diagonal entries of the density operator must be zero – this leads to random phase postulate. Meaning of the de Broglie wavelength in a gas in equilibrium at temperature T. | |
| **Grading** Attendance: 5%; Weekly quizzes or other written assessment: 30%; Midterm exam: 32.5%; Final Exam: 32.5% | |
| **Text Books** | 1. Callen, H., *Thermodynamics and an Introduction to Thermostatistics*, 2nd ed.,Wiley, 1985.<br>(The central textbook in this course. Japanese translation has fewer typographical errors.)<br>2. Reif, F., *Fundamentals of Statistical and Thermal Physics*, McGraw-Hill, 1965. |
| **Recommended Reading** | 1. Kittel, C., Elementary Statistical Physics, Dover, 2004. Highly recommended. Cheap to buy.<br>2. Zemansky, M.W. and Dittman, R.H., Heat and Thermodynamics, An Intermediate Textbook, McGraw-Hill,<br>1992. (Excellent for empirical basis of thermodynamics.)<br>3. Blundell, S. and Blundell, K., Concepts in Thermal Physics, 2nd Ed., Oxford University Press, 2010.<br>(Elementary explanations. Try this as an alternative. Many copies available in the library.)<br>4. Huang, K., Statistical Mechanics, Wiley. (Advanced reference.)<br>5. Kittel, C. and Kroemer, H., Thermal Physics, W.H. Freeman. (Try as alternative.)<br>6. Landau, L.D. and Lifshitz, E.M., Statistical Physics, Part I, by E.M. Lifshitz and L.P. Pitaevskii, Pergamon Press. (A classic book: thorough, advanced treatment.) |

# Quantum Mechanics II

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|---|---|---|---|
| **School/ department** | Physics Science | **Class room (and building)** | ES035 |
| **Day/Period** | Monday/5 | | |
| **Course content: basic/advanced (year students take it)** | Year 3 | | |
| **Lecturer (担当)** | **John WOJDYLO** | | |
| **Contact** — **Office** / **Phone** / **E-mail** | Office: Science Hall 5F 517<br>Email: john.wojdylo@s.phys.nagoya-u.ac.jp | | |
| **Welcome message** | This 2nd course in quantum mechanics is the first half of a full-year course. The goal is to enable students to attain a solid grasp of basic concepts. Underlying the teaching approach is the philosophy that in order to learn well, learners must make it a habit to produce many simple calculations: in this way the mathematical language becomes second nature and students learn to express with ease their physical intuition using it. This approach also instills critical thinking, as students make it a habit to verify statements for themselves and not just believe everything they are told. | | |
| **Any prerequisites/ expectations from the JP students** | This is a second course in quantum mechanics. | | |

**Course Contents** Shankar Chapters 1-10; or Susskind1 and Susskind2. Some topics are more fully explored in tutorials. Examinable content: equivalent to 15 lectures.

**Lecture 1. [1] Symmetries and Conservation Laws.** What is a state in classical mechanics? How do states evolve? State space, phase space. Why do trajectories never intersect? Newtonian mechanics. Formulation in terms of energy. The Lagrangian. Principle of Least Action. Euler-Lagrange equations. Cyclic coordinates and conserved quantities. (Susskind1)

**Lecture 2. [1] Symmetries and Conservation Laws cont'd.** We seek a better way to characterize the connection between symmetries and conservation laws. Poisson brackets. Continuous symmetries. Generators of infinitesimal transformations. Angular momentum is the generator of infinitesimal rotations. Linear momentum is the generator of infinitesimal translations. The Hamiltonian is the generator of infinitesimal time translations. The PB of the Hamiltonian with the generator determines a conservation law if G generates a transformation that leaves the total energy invariant. (Susskind1)

**Lecture 3. [0.75] Canonical Transformations:** transformations of phase space coordinates (not necessarily infinitesimal) that leave "the physics" unchanged. They map trajectories (i.e. a solution of the equations of motion) into physically equivalent (e.g. rotated) trajectories. (Shankar, Goldstein) NONEXAMINABLE: passive and active transformations. (Shankar, Goldstein)
**Optional Lecture 3B.** A closer look at: canonical transformations; generators of infinitesimal canonical transformations; symmetry and conservation laws; classical Liouville's Theorem. Phase space is like a flowing incompressible fluid. The flow is a symmetry transformation generated by the Hamiltonian. (Goldstein Ch 8 and 9.)

**Lecture 4. [1] Mathematical Tools of QM: A First Look.** What kind of mathematics do we need to describe QM experiments? (Based on Susskind2.)

**Optional Lecture 4B Mathematical Tools of QM.** Introduction. Discrete basis, continuous basis. Orthonormality relations, closure relations. (Cohen-Tannoudji, Chapter 2)

**Lecture 5 [1] Mathematical Tools of QM.** Dirac notation: ket, bra. Dual space. Discrete basis, continuous basis. Orthonormality relations, closure relations. (Same as last lecture, but in Dirac notation.) (Cohen-Tannoudji, Chapter 2)

**Lecture 6. [1] Mathematical Tools of QM.** Change of basis using Dirac notation: discrete/continuous basis. Matrix elements of operators. Psi in r basis, p basis: change of basis here is a Fourier transform. Eigenvalue equations and observables. Degenerate, non-degenerate eigenvalues. Orthogonality of eigenspaces belonging to different eigenvalues. Hermitian operators have real eigenvalues. The concept of "observable": e.g., the projection operator. (Cohen-Tannoudji, Chapter 2)

**Lecture 6B. [1] Mathematical Tools of QM.** Simultaneous diagonalization of two Hermitian operators: non-degenerate case; degenerate case. Block diagonal matrix. Functions of operators: differentiation, integration. Two useful, easy theorems. (Cohen-Tannoudji, Chapter 2; Shankar)

**Lecture 7. [0.5] Mathematical Introduction.** Some operators in infinite dimensions: X and K operator matrix elements in X and K bases. Commutation operator [X,K]. Hermiticity in infinite dimensions: necessary and sufficient conditions. (Domain of unbounded operators.) NONEXAMINABLE: Meaning of diagonalization of Hermitian operators: normal modes/stationary states. Example: two masses on three springs in one dimension. Example: string clamped at both ends. (Shankar p. 46-54, 57-73.)

**Lecture 7B [1] Postulates of Quantum Mechanics** (in-depth reprisal of Lecture 4). Quantum state. Reduction (collapse) of the wave packet; role of the projection operator; probability of results of measurement. [Time evolution of a system. (Susskind2 4.12, 4.13)] Quantization rules. Compatible, incompatible observables and the commutator operator. Imprecise measurements. (Cohen-Tannoudji p.213-225; 231-236; 263-266)

**Lecture 8. [1] Postulates (cont'd) and Simple Problems in One Dimension.** Why is a quantum ensemble necessary? (Shankar p. 125-127) Expectation value and uncertainty (Shankar p. 127-129). Example 4.2.4: Gaussian wave fn. (Shankar p. 134-141) How to extract experimental information from a wave function: probability that a particle has position between x and x+dx; probability that a particle has momentum between p and p+dp; uncertainty in position; uncertainty in momentum. Recipe for solving quantum mechanical problems: the propagator. Space-time propagator for a free particle in one dimension (Shankar p. 151-154).

**Optional Lecture 8B. Simple Problems in One Dimension (cont'd).** Time-evolution of the Gaussian wave packet. NONEXAMINABLE: The probability current. Wave packet incident on a potential step (1D scattering). (Shankar Chapter 5)

**Lecture 9. [0.5] The Classical Limit and Simple Harmonic Oscillator in X-basis.** (Revision of Fourier transforms. Midsemester exam up to here.) Ehrenfest's Theorem (Shankar Chapter 6 or Susskind2 4.9, 4.10). Why is the motion of a particle in the quantum regime different to its motion in the classical regime? Under what conditions do the classical equations of motion hold? (Shankar Chapter 6) NONEXAMINABLE: Solution of the linear SHO in the X basis (Shankar Chapter 7).

**Lecture 10. [1] SHO in the Energy Basis.** Ladder operators: creation and annihilation operators. Number operator. (Shankar Chapter 7 or Susskind2 Chapter 10.)

**Lecture 11. [0.5] Path Integral Approach.** Simplistic introduction: calculating the propagator using Feynman's path integral approach. The space-time region of coherence. (Shankar Chapter 8 or Susskind2 9.8 for an elementary description.) NONEXAMINABLE: Equivalence to the Schroedinger equation. The propagator for systems with potential energy of a certain, useful general form is relatively easy to calculate using the path-integral approach. Why? (Shankar Chapter 8)

**Optional Tutorial Lecture 11B. Path Integral Approach (cont'd).** We complete optional topics not finished in Lecture 11.

**Lecture 12. [0.75] Heisenberg Uncertainty Relation.** A purely "mathematical" derivation. (Susskind2 5.3-5.7, 8.5) Another purely "mathematical" derivation that exposes conditions for minimum uncertainty. The minimum uncertainty wave packet is a Gaussian. Application to estimation of ground state energy of hydrogen atom. (Shankar Chapter 9) NONEXAMINABLE: The standard U.R. gives the wrong result for certain pairs of canonically conjugate observables. Why? Domain of unbounded operators revisited. Derivation of a more generally applicable U.R. (Chisolm, American Journal of Physics 2001) following a simple rule.

**Lecture 13. [1] Systems with 2 or more identical particles.** Pauli Exclusion Principle follows from a basic experimental fact. (Gottfried) Bosons, fermions. Symmetry or antisymmetry of the TOTAL wave function. Fermionic and bosonic spatial or spin wave functions. Normalisation of state vector. Interference. Combining quantum systems: direct product spaces. Quantization in 1, 2, 3 dimensions (separable partial differential equations). (Shankar Chapter 10)

**Lectures 14, 15. [2] Combining Quantum Systems, Entanglement, Correlation.** (Susskind2 Chapters 6,7) We explore entanglement and correlations in a 2-qubit system. Density matrix (Shankar), reduced density matrix (Merzbacher, Gottfried).

**Grading (if registered officially and taking the course for credit):** Attendance: 5%; Weekly quizzes or other written assessment: 30%; Mid-semester exam: 32.5%; Final Exam: 32.5%

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| **Text Books** | 1. Shankar, R., 1994, *Principles of Quantum Mechanics*, 2nd ed., Kluwer Academic/Plenum.<br>2. Susskind, L. and Hrabovsky, G., 2013, *The Theoretical Minimum* [Classical Mechanics], Basic Books.<br>3. Susskind, L. and Friedman, A., 2014, *Quantum Mechanics: The Theoretical Minimum*, Basic Books.<br>4. Cohen-Tannoudji, C., Diu, B., Laloe, F., Quantum Mechanics, Wiley, 1991. Chapters 2 and 3 are required in the lectures. They complement, and at times supersede, the treatment in Shankar. |
| **Recommended Reading** | 1. Goldstein, H., Classical Mechanics, 2nd Edition.<br>2. Feynman, R.P., Leighton, R.B., Sands, M., 2011, *Feynman Lectures on Physics (Volume 3)*, Basic Books. (Highly recommended introductory book on quantum mechanics.)<br>3. Merzbacher, E., Quantum Mechanics, 3rd Ed., Wiley, 1998. (A great teacher of QM.)<br>4. Gottfried, K. and Yan, T.-M., 2004, *Quantum Mechanics: Fundamentals*, Springer. (Advanced reference. Excellent treatment of identical particles and PEP.)<br>5. Kreyszig, E., 1989, *Introductory Functional Analysis with Applications*, Wiley Classics. (Clear introduction to infinite dimensional Hilbert space, inner product spaces, spectral theory of linear operators, self-adjoint linear operators, etc. Read this - particularly the latter chapters on unbounded operators - if you want to clear up some mathematical concepts encountered in Shankar.) |

# Physiology and Anatomy 2 (Neuroscience)

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|---|---|---|---|
| **School/ department** | science/biology | **Class room (and building)** | A408 |
| **Day/Period** | Tuesday/ 2nd | | |
| **Course content: basic/advanced (year students take it)** | advanced (3rd year) | | |
| **Lecturer (担当)** | Young-Jai You | | |
| **Contact** – **Office** | SS508 | | |
| **Contact** – **Phone** | 052-747-6923 | | |
| **Contact** – **E-mail** | yjyou@bio.nagoya-u.ac.jp | | |
| **Welcome message** | Welcome! This course covers basics of neuroscience. | | |
| **Any prerequisites/ expectations from the JP students** | Cell biology will help. | | |

**Detailed course content:**

| Month | Day | Topic |
|---|---|---|
| 10 | 2 | 1. Introduction |
| | 9 | 2. Electrical signaling and ion channels |
| | 16 | 3. Synaptic transmission and synaptic plasticity |
| | 23 | 4. Motor circuits (LMN) |
| | 30 | 5. Motor circuits (UMN) |
| 11 | 6 | 6. Cerebellum and Basal ganglia |
| | 13 | Review session |
| | 20 | **EXAM** |
| | 27 | 7. Somatosensory system (touch, proprioception) |
| 12 | 4 | 8. Somatosensory system (pain) |
| | 11 | 9. Vision |
| | 18 | 10. Auditory system |
| | 25 | 11. Vestibular system |
| 1 | 8 | 12. Olfactory and gustatory systems |
| | 15 | Review session |
| | 22 | **EXAM** |

**Course teaching style (lectures with discussions, discussions, team work, etc.)**

Lectures with discussions and team work

**Course homework assignments:**

Medium load of homework – paper reading assignment possible

**Course examinations (if registered officially and taking the course for credit):**

Midterm exam: Nov 20; Final exam: Jan 22

**Grading of the course (if registered officially and taking the course for credit):**

Midterm and final exam each 40%; Participation and Quiz 20%

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| **Textbook** | Neuroscience (5 or 6 ed.), Purves et al. |

# First Year Seminar A

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| **School/ department** | Dept. of Earth and Planetary Sciences | **Class room (and building)** | C12 |
| **Day/Period** | Wed, 2nd period | | |
| **Course content: basic/advanced (year students take it)** | Basic (1st year) | | |
| **Lecturer (担当)** | HUMBLET Marc Andre | | |
| **Contact** — **Office** / **Phone** / **E-mail** | Office: Graduate School of Environmental Studies<br>Department of Earth and Planetary Sciences E516<br>Phone: 052-789-3037<br>Email: humblet.marc@f.mbox.nagoya-u.ac.jp | | |
| **Welcome message** | This course is a great opportunity to exchange viewpoints and ideas on a wide range of scientific topics, and I welcome all students to take this course and join the discussions! | | |
| **Any prerequisites/ expectations from the JP students** | None | | |

**Detailed course content:**

The goal of this seminar is (1) to teach students how to search for scientific information, (2) to encourage critical thinking, (3) to improve presentation skills, (4) to nurture scientific curiosity, and (5) to promote exchange of ideas about various scientific topics. The seminar is divided into two parts. The first part provides tips on how to search for information and how to give an oral presentation. This is followed by a discussion on centered on the definition of science and the difference between science and pseudoscience. A few lectures on coral reef ecosystems will serve as examples of how science can be communicated. The students will learn about the different kinds of reefs, the biology of corals and coral reefs, the factors controlling reef growth, the present-day threats on coral reefs, and the geological evolution of reefs. Students will also be able to examine hand-sized samples of coral reef limestones and observe thin sections under a microscope. During the second part of the seminar, the students will give two presentations each about any scientific subjects of their choice related to the marine or freshwater world. The fields covered can be as varied as underwater exploration technologies, marine biology, water in the solar system, hydroelectric energy… Each presentation is followed by a Q&A session. Class participation is strongly encouraged.

**Course teaching style**
Few lectures, mostly presentations and discussions

**Course homework assignments:**
Preparation of oral presentations

**Course examinations (if registered officially and taking the course for credit):**
None

**Grading of the course (if registered officially and taking the course for credit):**

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| Class participation (30%), oral presentations (70%).<br><br>**Course syllabus online:** course slides available from NUCT course account<br>**Course website or other online presence (if applicable):** | |
| **Textbook** | None |

# Earth and Planetary Sciences

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|---|---|---|---|
| **School/ department** | Dept. of Earth and Planetary Sciences | **Class room (and building)** | A407 (Building A) |
| **Day/Period** | Fri, 1st period | | |
| **Course content: basic/advanced (year students take it)** | Specialized (3rd year) | | |
| **Lecturer (担当)** | HUMBLET Marc Andre | | |
| **Contact** – **Office** / **Phone** / **E-mail** | Office: Graduate School of Environmental Studies<br>Department of Earth and Planetary Sciences E516<br>Phone: 052-789-3037<br>Email: humblet.marc@f.mbox.nagoya-u.ac.jp | | |
| **Welcome message** | I welcome to this course all students who wish to discover the solar system and look forward to exploring with them the fascinating landscapes of far-away planets, moons and other extraterrestrial objects. | | |
| **Any prerequisites/ expectations from the JP students** | None | | |

**Detailed course content:**

1. Introduction
2. The Solar System
3. Space Exploration
4. The Earth-Moon System
5. Mercury
6. Venus
7. Mars
8. The asteroid belt
9. Jupiter
10. Saturn
11. Uranus & Neptune
12. Trans-Neptunian Objects

**Course teaching style**
Lecture-based

**Course homework assignments:**
Essay, oral presentation

**Course examinations (if registered officially and taking the course for credit):**
Quizzes, reports, essay, oral presentation

**Grading of the course (if registered officially and taking the course for credit):**
Two quizzes: 20% (10% each), two short reports: 20% (10% each), oral presentation: 20%, written essay: 40%

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|---|---|
| **Course syllabus online:** course slides available from NUCT course account<br>**Course website or other online presence (if applicable):** | |
| **Textbook** | None |

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|---|---|
| **Course syllabus online:**<br>https://syllabus.sci.nagoya-u.ac.jp/detail/20180681080/890d44b3001e37166784007b6a699d886d10bb8d/<br><br>**Course website or other online presence (if applicable):** NUCT website TBA. | |
| **Textbook** | P. Atkins, J. de Paula & J. Keeler: Atkins' Physical Chemistry, 11th Ed., Oxford University Press, 2018.<br>(Sorry, the official syllabus on the School of Science syllabus website erroneously lists the previous 10th edition.) |

**"Post-Cold War Security Issues"**

**Course Syllabus Fall 2018**

**Course:** Special Problems (Post-Cold War Security Issues) (E)
Fall Semester 2018
**Instructor:** Professor Matthew Linley, PhD
**Class Times:** Monday 2:45 pm to 4:15 pm
**Class Location:** Seminar Room 4, 3rd Floor of Asian Exchange Plaza
**Office Address of Instructor:** International Education and Exchange Center, Room 305
**Email:** linley.matthew@j.mbox.nagoya-u.ac.jp

**IMPORTANT: This class is only open to third and fourth year students in the School of Law.**

I will respond to emails within 24 hours. However, before sending any email, I ask that you attempt first to find out the information that you require from one of your classmates. If you have specific questions about the course materials that require more elaborate discussion, please come to see me during office hours rather than send an email.

**Although there is no prerequisite for the course, students should have an interest in foreign affairs, be willing to read and participate in class discussions.**

**Course Goals and Methods:**

This course is an introduction to the subfield of International Relations (IR) known as Security Studies. Through a series of lectures, discussions and readings we are going to cover the most important concepts in International Security.

The course has three primary objectives:

1. To introduce students to the complexities of the relationship between political ends, military means, and strategy;
2. To teach students major theoretical perspectives in international security; and
3. To survey critical debates in the field.

In this course, students learn by reading and reflecting on the assigned texts, listening to the instructor's lectures, participating in class discussion, asking questions, and writing a research paper.

**Required Text:**

There is no required textbook for this course. The Instructor will provide a list of readings.

**Course Policies**

This class meets 1.5 hours a week. Students should expect 2 to 5 hours of preparation (reading, reflecting, preparing written assignments, reviewing notes, preparing for tests, etc.) per week.

**ATTENDANCE AND CLASS PARTICIPATION POLICIES**

**Attendance Policy:** We cover a lot of material in each class, so students are expected to attend every lecture. The instructor reserves the right to contact students who are absent from class by email. I will grade students based on attendance and class participation.

**Controversial Subject Matter:** Like most courses in Political Science, we will be discussing topics that some students may consider controversial. Some students may find that some of the readings and comments in class challenge their belief systems and worldview. Our purpose in this course is to explore this subject matter deeply and consider multiple perspectives and arguments. Students are expected to listen to the instructor and one another respectfully, but of course are free to disagree, respectfully, with views expressed in class.

**Course Grade**

The course grade for this course will be determined according to the following formula:

1. Class Participation 20%
2. Research Proposal 10%
3. Mid-Term Exam 20%
4. Final Research Paper 25%
5. Final Exam 25%

1. **Class Participation (20%):**

Students are required to attend all classes, to do all required readings for each week, and to take an active role in discussing the readings. I will evaluate participation as <u>preparedness</u> and <u>input to discussion</u>.

Students will receive a participation grade for <u>each class</u> based on the following criteria.

| Grade | Criteria |
|---|---|
| **0** | Absent. |
| **1** | □ Present, not disruptive.<br>□ Tries to respond when called on but does not offer much.<br>□ Demonstrates very infrequent involvement in discussion. |
| **2** | □ Demonstrates adequate preparation: knows basic case or reading facts but does not show evidence of trying to interpret or analyze them.<br>□ Offers straightforward information (e.g., straight from the case or reading), without elaboration or very infrequently (perhaps once a class).<br>□ Does not offer to contribute to discussion but contributes to a moderate degree when called on.<br>□ Demonstrates sporadic involvement. |

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| **3** |  Demonstrates good preparation: knows reading facts well, has thought through implications of them.<br> Offers interpretations and analysis of case material (more than just facts) to class.<br> Contributes well to discussion in an ongoing way: responds to other students' points, thinks through own points, questions others in a constructive way, offers and supports suggestions that may be counter to the majority opinion.<br> Demonstrates consistent ongoing involvement. |
| **4** | Demonstrates excellent preparation: has analyzed reading exceptionally well, relating it to readings and other material (e.g., readings, course material, discussions, experiences, etc.).<br> Offers analysis, synthesis, and evaluation of class material, e.g., puts together pieces of the discussion to develop new approaches that take the class further.<br> Contributes in a very significant way to ongoing discussion: keeps analysis focused, responds very thoughtfully to other students' comments, contributes to the cooperative argument-building, suggests alternative ways of approaching material and helps class analyze which approaches are appropriate, etc.<br> Demonstrates ongoing very active involvement. |

2. **Research Proposal (10%):** The student must prepare a 2-page research proposal for their Research paper.
3. **Mid-Term Exam (20%):** There will be a mid-term exam covering course material from Lectures 1-7 on June 15.
4. **Research Paper (25%):** There will be a 8-10-page research paper in this course on a topic related to Security Studies and selected by the student after discussing with the Instructor.
5. **Final Exam: 25%:** There will be a final exam in this course covering material from Lectures 8-15.

**Letter Grades**

S=90-100

A=80-89

B=70-79

C=60-69

F=59 and Below

I do not artificially inflate any grades or round up grades after the semester ends. I also do not offer extra credit. You are encouraged to attend all lectures and keep up with readings throughout the semester. If you are having problems in the course then you should come and discuss them with the instructor. Leaving it until final grades are in is too late.

## Course Outline

### Week One: Introduction to the Course and Security Studies

First, we review the syllabus, course content, and grading system. Second, we discuss what the study of Security as an academic discipline, including its history and the main issues and topics it focuses on.

Readings

None

### Week Two: International Security in 2018 - Trends in International Conflict and Security

Is the world becoming more secure or less secure? We examine trends in armed conflicts since 1945 and then briefly discuss some of the most important contemporary international security issues.

<u>Readings</u>

Chapter 11: Peace. (Pinker 2018)

<u>Other</u>

Professor will hand out research proposal assignment

### Week Three: Theories of International Relations and Security Studies

We will review the two main theories of International Relations - Realism and Liberalism. We will discuss their usefulness in examining issues related to security.

<u>Readings</u>

Chapter 3: Contending Perspectives – How to Think about International Relations Theoretically (Mingst and Arreguín-Toft 2017)

### Week Four: Interstate War

We will discuss the concept of war, different philosophies of war, and the functions of war beyond military victory. We also consider why countries go to war with one another at particular times and with particular countries.

<u>Readings</u>

Chapter 13: War (Williams 2013)

## Week Five: Preventing War – Alliances, Regional Institutions and the United Nations

What are alliances and why so some survive while others disappear? What role do regional institutions play in providing international security? How does the United Nations contribute to peace? In this lecture we consider the importance of institutions in maintaining international order.

Readings

Chapter 23: Alliances (Duffield 2013)

Chapter 25: The United Nations (Weiss and Zach 2013)

## Week Six: Nuclear Disarmament and Non-Proliferation

How should we understand the following challenges to the disarmament and non-proliferation of nuclear weapons regime?

- States within the existing non-proliferation regime (i.e. US, Japan, EU, Canada, China)
- States outside the non-proliferation regime (i.e. North Korea)
- Non-state actors, such as terrorist organizations (i.e. ISIS, al Qaeda, Aum Shinrikyo)

Readings

"Proliferation, Nuclear" (Way 2008)

Other

Research Proposal Due

## Week Seven: Civil War

Why do civil wars seem to occur more frequently in some parts of the world than others? What are the causes? We will review some of the vast literature on this topic and consider why civil wars occur.

Reading

"Civil Wars" (Moro 2017)

## Week Eight: Mass Killing and Humanitarian Intervention

Why do different ethnic and religious groups in some societies live peacefully with one another while in others they resort to violence to wipe the other out? Despite knowledge of human rights violations in a country, why do so few states send in their military to prevent it from happening? Using examples of ethnic conflict in the post-Cold War period we will consider the question of why genocides occur during specific times and places.

Reading

"Genocide" (Campbell 2017-)

## Week Nine:  Mid-Term Exam

## Week Ten: Terrorism and Counterterrorism

Why do large states sometimes lose wars to small ones? Why do terrorists take on large states even though they are unlikely to defeat them? We will consider the concept of asymmetrical warfare

Readings

"Chapter 13: Terrorism" (Pinker 2018)

"Terrorism" (Cronin 2018)

## Week Eleven: Human Security, Poverty and Health

What are the advantages and disadvantages of shifting the subject of security from the state to the individual? Should issues such as poverty and health be included in the security agenda or kept separate?  We will discuss the definition of human security and how it has contributed to the academic debate in security studies.

Reading

"Human Security" (Newman 2017-)

## Week Twelve: The International Arms Trade / Energy Security

In this class, we will examine two different topics. In the first half of class, we will talk about how sales of major combat equipment poses a challenge to managing relations between states, with an emphasis on small arms and light weapons. In the second half, we will consider the growing international concern about the future availability of energy supplies.

Readings

"Chapter 29: The International Arms Trade" (Hartung 2013)

"Chapter 29: Energy Security" (Bros 2018)

## Week Thirteen: Population Movements and Environmental Security

Why should we see the movement of people as a security issue? What are the different types of population movements and how do states deal with them? And how do events such as floods, drought and starvation affect security? In this class we will discuss how population movements can influence war, violence and conflict.

Readings

"Migration" (Klotz 2018)

"Climate Change and Conflict" (Parenti 2017)

## Week Fourteen: Transnational Organized Crime

How has transnational organized crime emerged over the past 20 years to become a serious threat to national and international security? How is this related to globalization and the weakness of states in different part of the world? In this class we look at some examples of major transnational criminal organizations and the efforts of states to combat them.

Reading

"Crime: The Illicit Global Political Economy" (Picarelli 2017-)

Other

Research Paper Due

## Week Fifteen: Course Conclusion and Review for Final Exam

What is the future of security studies and the relationship between policy and academia?

Readings

None

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