

Introduction to  
Computer Science and Engineering  
コンピュータ工学のすすめ

Lecture one  
Overview of the course

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## Contents of Today's Lecture

- Overview and purpose of the course
- Class Schedule (tentative draft)
- Some basic knowledge to understand the computer science and engineering (CSE for short)
  - Differences of Science and Engineering
    - Generally speaking
    - Computer science and computer engineering (CS and CE)
  - Some sense on the target of CSE
  - Basic concepts and courses of CSE
  - Advanced Research fields of CSE
  - Other related disciplines
- Homework

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## Overview : Main contents of the course

- Concept and scope of computer science and engineering
  - What are Computer Science and Engineering, what are not ?
- Key concepts and fundamental courses/subjects of CSE
- Advanced research fields in CSE, specially in University of Aizu
- How to apply CSE and ICT to real business (visiting ventures)
- Skills for studying the CSE
  - Know the overview and have your own map on the CSE
  - Skills for searching information and presentation
  - Opportunities of discussion with each other students
  - Familiar with some professors doing advanced researches, and being able to access and get advices from them

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## Purpose of the course: Objectives and attainment goals

- The students can understand
  - the basic concepts and basic courses for computer science and engineering (CSE for short).
  - And know some advanced research field in CSE
  - In addition, students will have opportunities, to visit local venture companies using ICT and knowledge of CSE
  - to make presentation based on their understanding on CSE,
  - and to discuss with each other on the topics to enhance their understanding of CSE.
  - Moreover, the students can have broad views and familiar with the methods for learning computer science and engineering

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## Class schedule and topics (1)

### Quarter 3

- 1) **Nov. 1 Introduction to the course, some basic concepts (S. Tei)**
- 2) **Nov. 8 Orientation for oversee students in Advanced ICT program**  
(Dr. Zhou supported by Prof. Kansan, Mr. Watanabe )
- 3) **Nov. 15 Basic concepts and courses of computer science and engineering (1) (Prof. S. Tei)**  
Computer Architecture, OS, Computer Networks

\* 11月22日 no classes

- 4) **Nov. 29 Presentation by students on “My understanding on Computer Science and Engineering (Prof. Tei, Prof. Junbo Wang)**

### Quarter 4

- 5) **Dec. 6 ? Visiting local venture company 1 (coordinator Prof. Kansan)**
- 6) **Dec. 13 ? Visiting local venture company 2 (coordinator Prof. Kansan)**
- 7) **Dec. 20 ? Visiting local venture company 3 (coordinator Prof. Kansan)**
- 8) **Jan. 10? Report & presentation on the visiting of ventures**  
(Prof. Tei, Prof. Kansan)

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## Class schedule and topics (2)

2017 Spring, Q1 and Q2

- 9) **Basic concepts and courses of computer science and engineering (2)**  
Algorithms, Computer Languages, Compiler, Database
- 10) **Advanced and strategic researches on UoA (1)**  
Introduction to Deep Learning and Robotics
- 11) **Advanced and strategic researches on UoA (2)**  
Cloud computing on the Big Data, healthcare and bio-engineering
- 12) **Advanced and strategic researches on UoA (3)**  
Introduction to High-performance computing & Security, & VR, CG,
- 13) **Introduction to the divisions, curriculums, fields and graduation thesis,**
- 14) **Introduction to the graduate school (Prof. S. Tei)**
- 15) **Debates & discussion (including Japanese students) & report**  
On “ What Should We Learn and How to Learn ”

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**Comparison of Science and Engineering**  
**理学と工学の比較**

**Problem 1 :**  
**Could you put the following terms into the table below**

Investigating  
Possibility

Discover

How

Theory

Why

Invention

Method

Find  
solution

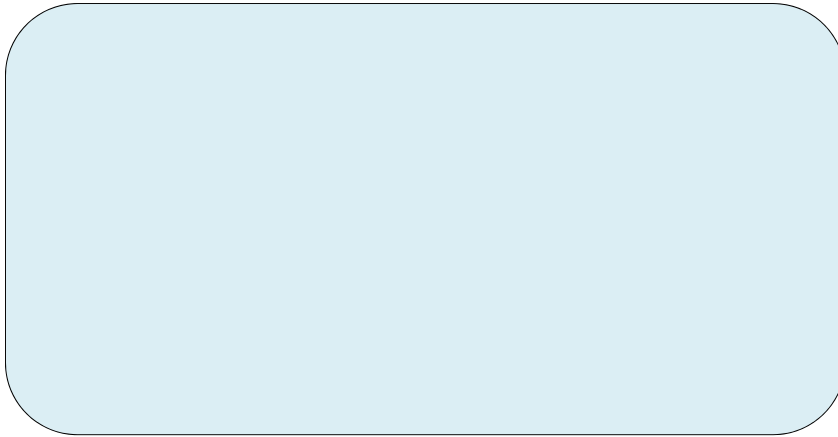
理学 Science	工学 Engineering

**Comparison of Science and Engineering**  
**理学と工学の比較**

Answer will be given at the lecture time

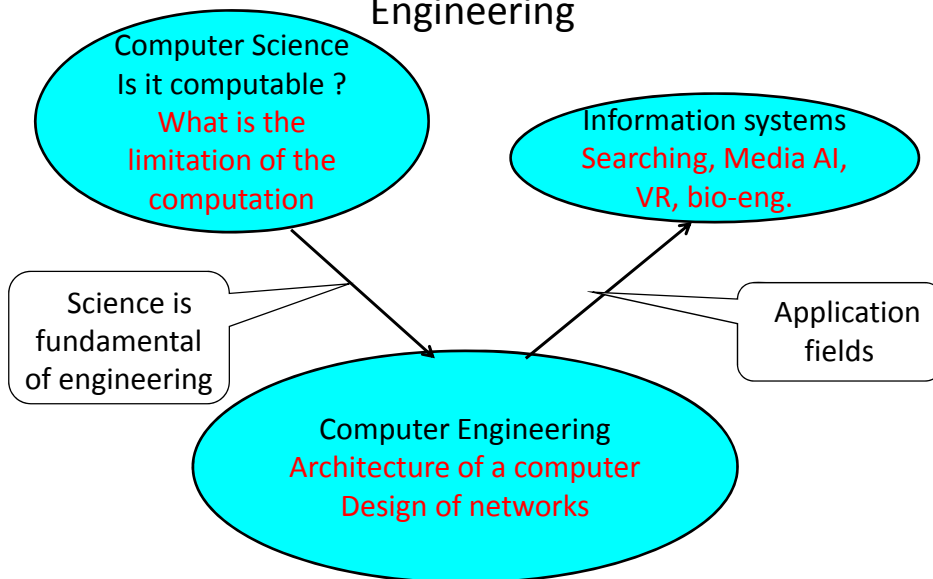
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### Quiz (1)



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### Relations of Computer Science or Computer Engineering



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## What is CSE

- A field to study consisting of
  - the theoretical computation process and
  - the design of computational systems,
  - including algorithmic process, computing paradigms, hardware, software, and networks.
- Structure and components of CSE, Just mention a few
  - Theory of computation, Mathematics of computing, Algorithms and data structures, Operating Systems, Compilers, Computer architecture, Communications and wireless networks, Computer vision and robotics, and more
  - Research fields, for some examples  
Theoretical works, Security, Cloud computing and Big Data, Advanced computer networks, and IOT, HPC and super computing, Artificial Intelligence and Robotics

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## Some basics of CSE

- Basic architectures
  - von Neumann architecture
  - Layered architecture (network)
- Basic theories (science )
  - Automaton theory (Computation)
  - Queuing theory (Communication)
  - Graph theory
  - Optimization theory
- Basic methods/paradigms
  - Theoretical approach
  - Experiment approach
  - Simulation approach
  - Data analytic and mining approach

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### Scope/targets of CSE

**Problem 2:**  
**Could you arrange the following objects/things such that the tighter relation with CSE, the closer to the CSE**

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### The scope/target of CSE

One of the Answers

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## Quiz (2)

For 3<sup>rd</sup> year students,  
Could you add new quiz question and give the answers,  
in similar ways

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## Find mapping of the works with the subjects

### Works

Data storing

Using CPU Efficiently

Connecting CPU,  
memory, Bus

Finding efficient way  
to get the results

Making a program

Communication  
between computers

Changing a program  
to executable code

### Subjects

OS

Network

Database

Compiler

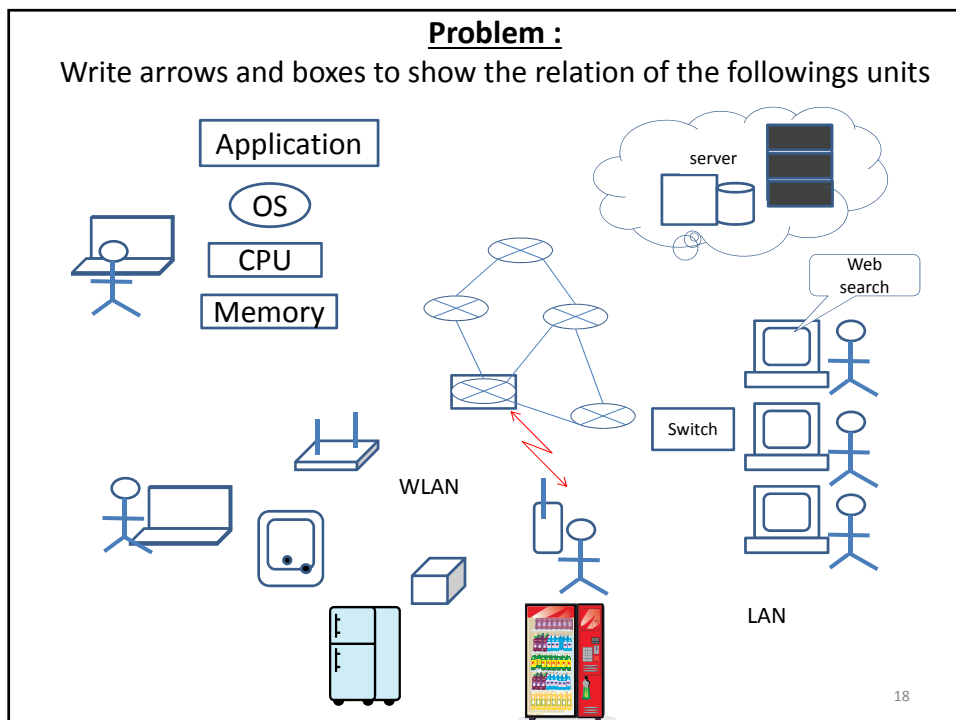
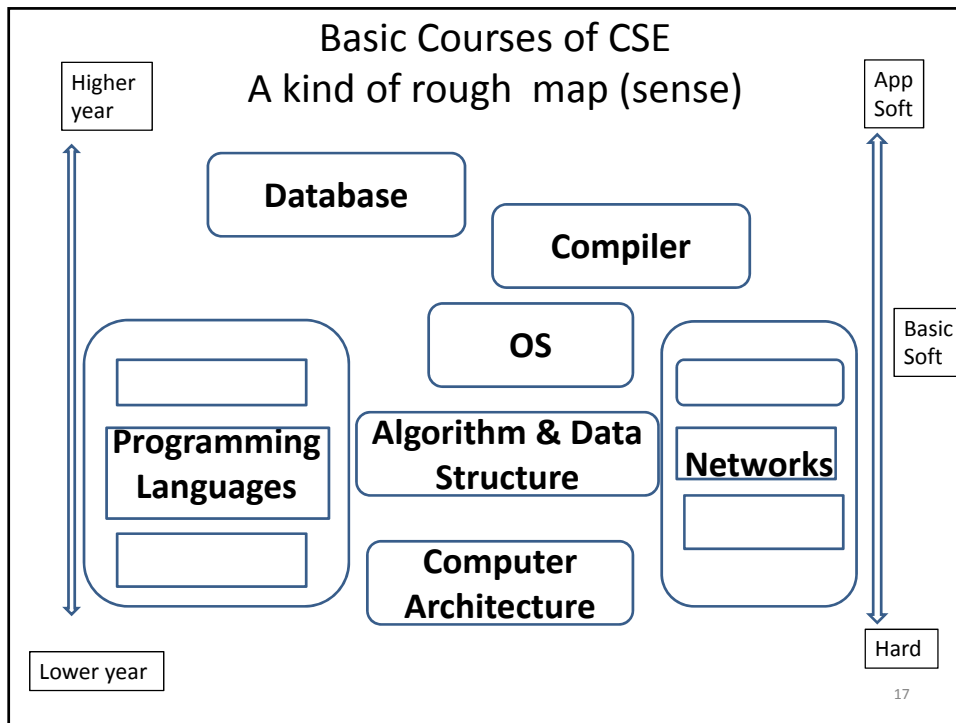
Algorithm

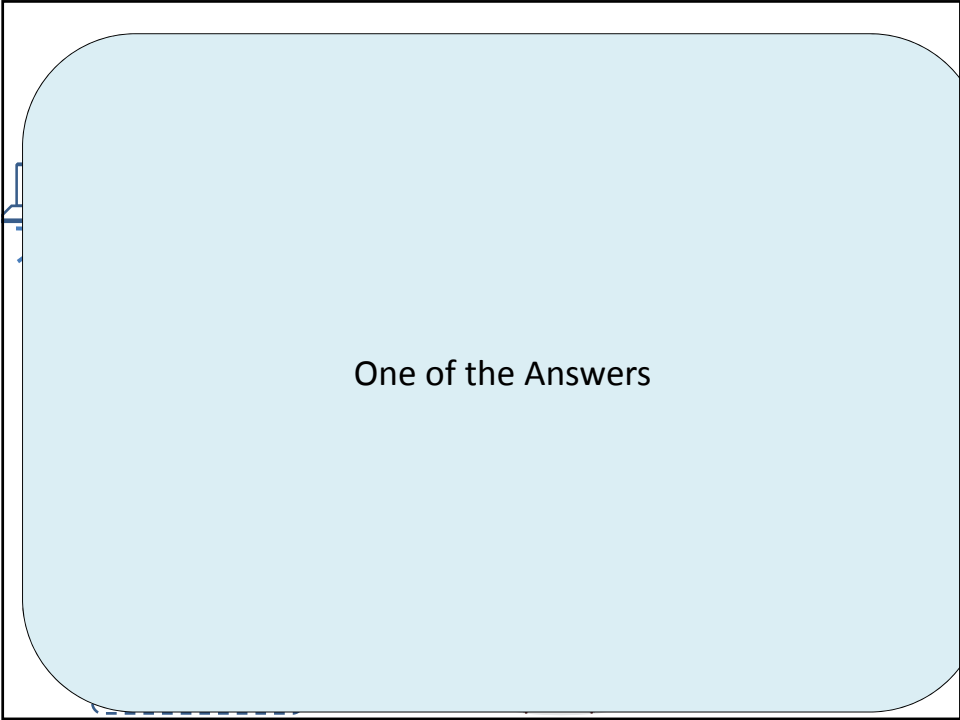
Programming  
Languages

Architecture

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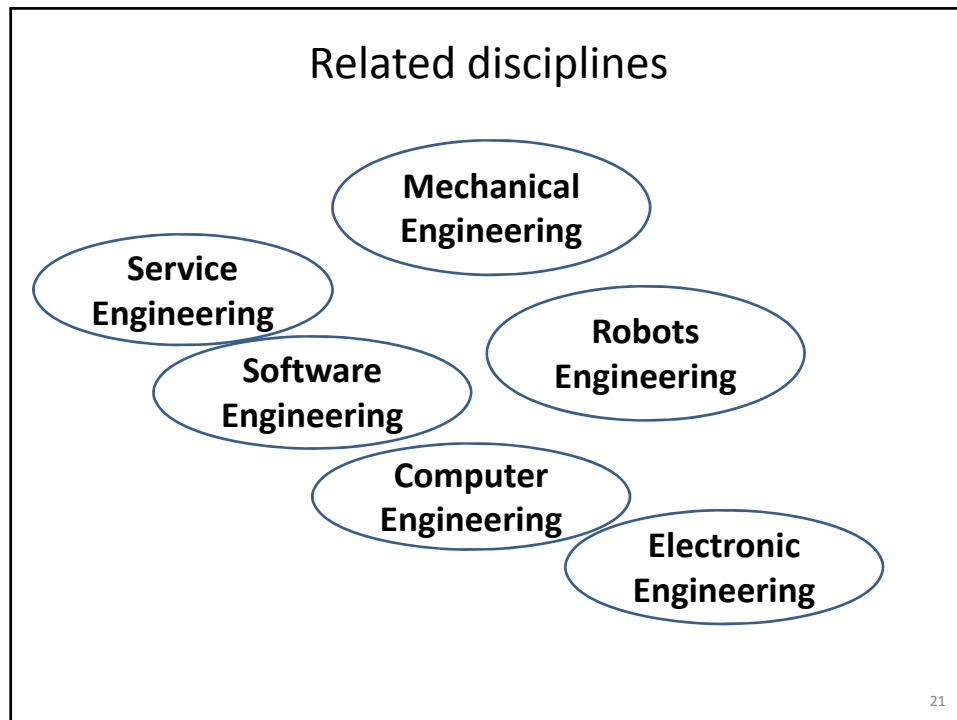




One of the Answers

## Advanced Research fields of CSE in UoA

- Advanced and strategic researches in UoA (1)
  - Artificial intelligence (AI) and machine learning (ML)
  - Robotics:
- Advanced and strategic researches in UoA (2)
  - Cloud computing on the Big Data
  - healthcare and bio-engineering
- Advanced and strategic researches in UoA (3)
  - High-performance computing
  - Security
  - VR
  - CG:



- ### Summary
- This course will give you a guideline to study CSE
  - CSE is to study theoretical computation process and algorithms and design of computational systems
  - It consists of many subjects, and research fields, as well as many concepts.
  - It has relation with other related fields such as Mechanical Engineering, Robots Engineering, Service Engineering , but is different
  - Having a big picture and know how to study the fields are important
    - Searching and surveying materials
    - Presenting and discussion
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## Homework (don't submit)

- Check the syllabus of UoA undergraduate programs

<https://www.u-aizu.ac.jp/en/curriculum/syllabus/>

[http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016\\_1\\_E\\_011.html](http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016_1_E_011.html)  
[http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016\\_1\\_E\\_012.html](http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016_1_E_012.html)  
[http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016\\_1\\_E\\_013.html](http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016_1_E_013.html)  
[http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016\\_1\\_E\\_010.html](http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016_1_E_010.html)  
[http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016\\_1\\_E\\_014.html](http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016_1_E_014.html)  
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[http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016\\_1\\_E\\_021.html](http://web-ext.u-aizu.ac.jp/official/curriculum/syllabus/2016_1_E_021.html)

- Search the www on the courses, OS, computer architecture, and computer networks
- Search the www on the basics of architectures, theories, and methods

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## Homework

- Write a report with two A4 pages
  - Submit to
    - Prof. Tei [z-cheng@u-aizu.ac.jp](mailto:z-cheng@u-aizu.ac.jp),
    - cc : [sgu-office@u-aizu.ac.jp](mailto:sgu-office@u-aizu.ac.jp)
    - Subject ReportCSE(1) by YYYY (YYYY means your name)
    - By Nov. 11 Fri. at 20:00
    - Word format (or PDF )
  - Contents
    - Searching related survey, or article, on one of today's topics
    - Read the survey, paper, or article,
    - Write your comments and understanding on the reading
    - Write your interests related with computer science and engineering

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