Syllabus for TU STEM Summer Program (TSSP):

Exploring the Frontier of Science and Technology

June 15-July 10, 2020 at Tohoku University, Sendai, Japan

(Tentative)

PROGRAM DESCRIPTION

Japan continues to be a world leader in technological, manufacturing, and engineering innovation. **Tohoku University STEM Summer Program (TSSP): Exploring the Frontier of Science and Technology** provides a unique opportunity for freshmen and sophomores to learn about the originality and the state of the advanced and art technology that can be seen in various engineering produced in Japan. Students will also get hands-on experience learning about creative science and engineering at one of Japan's premier universities, Tohoku University, in Sendai City.

During the course of the program, students will be introduced to fundamental engineering concepts through lectures, lab visit, and laboratory work. Students then work on project teams with Tohoku University engineering students to use innovative engineering concepts to solve problems. In addition, several special seminars and lectures are given by experts to develop knowledge about more advanced science and engineering principles.

During the four-week program, lessons and site visits will show students how Japanese society impacts the country's culture of science and engineering. The program provides Japanese language training and exposure to traditional local culture through workshops and site visits. Several field trips will take students to tour J-PARC of a series of world-class proton accelerators and the experimental facilities, a production plant for a Japanese automotive manufacturer, to visit the historic castle in Shiroishi, and to see the recovery efforts in coastal areas around Sendai, most affected by the 2011 tsunami.

LEARNING OBJECTIVES

This course has been designed to provide students with the contextual engineering background to apply critical thinking skills to modern engineering problems in an international context. Through this course, you will be able to:

1) Understand key information about advanced science and engineering concepts and their application in professional engineering practice
2) Demonstrate a knowledge of engineering culture and practice in Japan
3) Utilize technical design skills
4) Work effectively in diverse teams
5) Articulate your own academic and professional goals related to science and engineering

6) Communicate at an introductory level in Japanese and apply the language in real-world contexts

ATTENDANCE POLICIES

Attendance is mandatory at all academic activities, including laboratories, guest lectures, instructor lectures, laboratory visits, field trips, discussion groups, course meetings, etc. Academic activities are scheduled on all weekdays and some Saturdays. Excessive tardiness or absence may be grounds for dismissal from the program. Optional activities will be advertised as such and may include trips to sightseeing, shopping, or social gatherings. **Each student submits a Summary (a word file) of what you learned from each activity in 250 words.** If it is unclear if an activity is optional, please ask Prof. Kasukabe and/or other professors.

PROGRAM SCHEDULE

Program schedule is shown below. This Program has been designed to require 200 hour of work, equivalent to an 8-ECTS, 4-week long course. The outline below is provided to help students guide use of their time.

A. Students pre-program work and home work during the program

Pre-program work before the program and home work during the program (40 educational hour equivalents):

- 12 hour equivalents: pre-program work (including self-study about Japan)
- 28 hour equivalents: home work during the program

B. June-July Program Time:

160 educational hours over the 4 weeks term with approximate distribution as follows

- 2 hour equivalents of orientation and guidance
- 38 hour equivalents of lectures and lab-visit, including reading preparation
- 44 hour equivalents of group laboratory projects, including reading and report preparation
- 44 hour equivalents of field trips, including reading preparation
- 12 hour equivalents of culture learning
- 8 hour equivalents of language learning, including exercises
- 6 hour equivalents of group discussion
- 6 hour equivalents of individual and group presentation, including PPT preparation

A reading list will be posted in this program site to allow advance preparation. Readings are designed to coordinate with guest lectures, laboratory visits, group laboratory projects and field trips. Final details and assignment schedules will also be posted.

TEACHING APPROACH

This course will focus on learning from "hands-on" projects, field trips, expert topical lectures, targeted scholarly readings, culture and language experience, group discussion, and student presentations.

STUDENT WORK AND ASSIGNMENTS

Student work outside of lectures, lab visits, lab work and field trips which will consists of the TSSP 2020.

Study log and reflection: Students will keep a log recording notes, thoughts, and questions that arise during the program. Designated time will be set aside in the schedule for reflection on technical and cultural topics. In some cases, these individual thoughts will form the basis of small group discussion.

GRADING/SCORING

Students receive a numeric grade for their work. Students should expect grades to be comparable to those awarded for on-campus study.

Learning will be assessed in the following ways:

20% Participation in lectures, project lab work, lab visits, and field trips

Because of the unique nature of this study abroad program, engaged participation in all program activities is critical to allow for learning. Therefore, students are expected to attend all program activities and actively participate. As a general rule, students please note that being present is not the same as participating.

30% Study log

You will be given a dedicated log book. Keep your all recording of your experience in the log book during the program. You should include lecture notes, lab results, field trip notes, data from readings, cultural observations, opinions on the engineering topics, and reflections on experiences. This information will be used for your final report and presentation preparation. At certain points during the program, you may be asked to include specific information in your study log (e.g., response to a question posed by the program director). **Your Log Book will be collected and graded for completion before final presentation.** Students should plan to fill 5-10 pages of their notebook each week to receive full points.

20% Reports from three hands-on-laboratory

Lab report format and other details TBA

30% Project report and presentation

Each student will make a presentation, covering what you learned from this program and what you found interesting in your potential career. The presentation will be made on the last day of the program.

FINAL ORAL PRESENTATION AND REPORT

Final oral presentation: individual presentation during a five-hour presentation session
Final report: 4 pages in A4 format (TBA).
Contents: Students will discuss either the frontier science and technology or the science and technology of disasters and damage reduction. Based on insights through the study of Japanese language and experience of Japanese culture and traditions, they will discuss how uniquely Japanese ways of thinking and approaches affect and influence the program's themes, their thoughts on basic sciences and cutting edge technologies, and how this program relates to their future careers.

Tip for your presentation

TU STEM Summer Program has given you opportunities to challenge yourself in multiple ways over the four weeks of the program. Before departing from Sendai, we want you think about your experiences and consider the skills, knowledge, and awareness you will take away from this program as a result. To help you with this, you will give a final presentation reflecting on what you have learned.

In your presentation, you will identify critical incidents you experienced in the program. A critical incident is "an event which made you stop and think, or one that raised questions for you" (Monash University, 2017). You should address at least one critical incident in each of three areas related to the learning objectives for the course: 1) technical learning in lectures and labs, 2) Japanese culture and language, and 3) your personal and academic development. For each incident, reflect on why it was important to you and what knowledge you will take from it. You can refer to steps of the DEAL Model of Critical Reflection (Ash & Clayton, 2009) to help with this:

1. **D**escribe the incident you experienced in an objective and detailed way (What happened? How did you feel and react?)
2. **E**xamine the incident beyond just summarizing it to understand why it was important (What did you learn? Why does it matter?)

3. **A**rticulate your **L**earning from that incident and how you will apply what you learned in the future (What will you do now? How has this experience affected your future goals and plans?)

Lectures and labs	**Culture and language**	**Personal and academic development**
1.What occurred in this incident? What was your initial reaction to it? 2. What was engaging or challenging about this incident, and why? What other questions do you have a result of this incident that you would like to answer? How did the lecture style used by the Japanese professors affect the way you learned in the lectures and labs? 3. How might your academic and professional careers be affected as a result of what you learned?	1. What occurred in this incident? What was your initial reaction to it? 2. Why did you find this incident engaging or challenging? How did it improve your understanding of Japanese language and culture? What other elements of Japanese language and culture might provide context for this incident? 3. What did this experience make you realize about how you interact with new cultures? How might you be able to generalize what you learned from this experience and apply it to your encounters with other cultures in the future?	1. What occurred in this incident? What was your initial reaction to it? 2. What assumptions and expectations did you bring to this incident? How do you interpret the thoughts and behaviors of the other people involved? 3. How did this incident reinforce or challenge your values, beliefs, or priorities? How did this incident impact your sense of personal or academic identity, or your identity as a future engineering/scientist? How has this experience prepared you to respond to similar situations in the future?

You should address at least one incident related to each focus area, but you can provide more details on a given area if you have more to say about what you learned in that area. Also, a single incident may correlate to several focus areas; for instance, an incident that occurred during a lab session may have had an impact on your view of your own academic identity and development. In that case, you can present that incident as an example of one of the relevant lectures areas, but you should still provide 2 additional incidents. While this is an academic presentation, we hope this will also serve you after this program as a record of your thoughts, observations, and experiences in Japan as well as a guide to help you put into practice some of your new skills, knowledge, and awareness. So feel free to have fun with this; photos, memes, etc. are encouraged if they will help make this a better reference point for you in the future.

Presentations will be graded on the following criteria:

- Presentation addresses at least one critical incident from the three focus areas
- Presentation demonstrates deep engagement with the process of examining the incidents to understand the context surrounding it and why it is important
- Presentation shows how the reflection of the incidents leads to a set of realistic, achievable, and productive goals for the student's future
- Presentation offers high level of substantive reflection that will allow it to be useful as a guide for future practice

Summary of TU STEM Summer Program Assignments

(1) Group Lab reports

1. **Challenging Experiments for Quantum Theory** performed on 6/17(W).
   Report due: **noon on Monday June 22**

2. **Paper Aircraft Competition** performed on 6/18(Th) and 6/19(F).
   Report due: **noon on Monday June 29**

3. **Fastest Clip Motor Competition** performed on 7/7(Tu)
   Report due: **noon on Thursday July 9**

Report size: Single spaced 3 page max. including figures and tables
12 font Times New Roman

(2) Lectures:

1.	June 16 (T)-M	Tohoku Earthquake (Prof. Matsuzawa)
2.	June 18 (Th)-M	Intro to aircraft design (Prof. Nakamura)
S1.	June 22 (M)-M	Mat Sci of Japanese sword making (Prof. Ohuchi)
3.	June 24 (W)-A	Symmetry Breaking Create Nature (Prof. Tanaka)
4.	June 26 (F)-M	Structural metallic materials (Prof. Yoshimi)
5.	June 26 (F)-A	Robotics for SpaceExploration (Prof. Yoshida)
6.	June 29 (M)-M	Historical and Social Approaches to Disaster (Profs. Ebina and Boret)
7.	June 30 (T)-M	Origin of Life (Prof. Kakegawa)
8.	June 30 (T)-A	Japanese second sample return mission: Hayabusa2 (Prof. Nakamura)
9.	July 2 (Th)-M	Interactive "Content" Design (Prof. Kitamura)
10.	July 2 (Th)-A	Advanced research with accelerator (Prof. Koike)
11.	July 6 (M)-M	Spintronics (President, Prof. Ohno)
12.	July 8 (W)-M	Renewable Energy Systems (Dr. Warzecha and Ms. Mehta)

Summary of what you learned from it in 250 words.
Google Classroom will be created. Each student submits a word file
File name: n_your last name (example: **3_smith.docx** = lecture **3** written by **smith**)

(3) Final report due by 8:00 am on Friday, July 10, Final presentation on Friday, July 10.

See the details on the previous pages.
Final report: Single spaced 4 page including figures and tables 12 font (Times New Roman)
Final presentation: 10min. (PPT slides not more than 10 pages).

QR code for Google Classroom