

EEM340 Basic Manufacturing Engineering for Creative Technologists

3rd and 4th quarters, Junior

Instructor	OKADA MASATO
Style of Class	Lecture
Number of Credits	2
Day and Period	To be advised

Course Description

Distinct from simple “production” or “manufacturing,” monozukuri is defined as “the entire process of conceiving, designing, manufacturing, using, disposing of, recovering, and re-using human-made ‘things’ (including combinations of tangible objects and non-tangible software) with the aim of enhancing convenience in human society, the results of which can contribute to an increase in social and economic value as well as minimizing impacts on the human and natural environments” (Manufacturing Science Subcommittee, Committee on Mechanical Engineering, Science Council of Japan). In line with this definition of monozukuri, this course deals with matters connected with monozukuri in a holistic sense.

In this course we study the foundations of monozukuri and the environment surrounding monozukuri today. Using the example of mechanical engineering, which is tangible and therefore easy to grasp, explanation is provided of a variety of methods for processing materials into products. Next we explain graphical and textual methods of expression that are essential when communicating matters to third parties, and conduct group work involving working with other students to solve assigned problems, with the aim of cultivating the creativity and practical capacity necessary for monozukuri. There are also special lectures given by distinguished guest speakers involved in monozukuri.

Course Objectives

To develop the ambition to continue cultivating one’s ability to create and realize ideas, and a fundamental capacity to conduct actual monozukuri activities. Additionally, to acquire the basic ability to create new ideas by examining methods of turning raw materials into manufactured products, and to understand the position and role of one’s own specialization within a diversity of specialist fields.

Prerequisites

None in particular.

Class Materials

Handouts to be distributed for each class.

Course Method

Classes are mainly operated in a lecture format. Materials will be distributed as necessary in order to supplement class content. Each class will include a brief explanation of the content of the next class, so it is advisable to do some background research on that content before the next class. Audiovisual materials may also be used in order to aid understanding of the various monozukuri methods.

Evaluation/Assessment

Submit mid-term report during the teaching term.

Grading

Mid-term report: 40%

Final examination: 60%

Course Schedule

Week 1: Foundations and current state of monozukuri in general

Definitions of monozukuri; current conditions surrounding monozukuri.

Week 2: Overview of casting/welding

Overview of casting and welding, one of the methods for creating products out of raw materials.

Week 3: Overview of cutting

Overview of cutting, one of the methods for creating products out of raw materials.

Week 4: Overview of plastic forming

Overview of plastic forming, one of the methods for creating products out of raw materials.

Week 5: Digitization of processing machinery

Overview and current status of numerically controlled machine tools, which utilize digital symbols for motion control and have come into mainstream use in the process of creating products out of raw materials in recent years.

Week 6: Japanese orthography

Necessity and general rules of Japanese orthography necessary in order to communicate things and matters to others accurately in written form; includes study of examples of failure.

Week 7: Methods of graphical expression

Necessity and general rules of graphical expression necessary in order to communicate things and matters to others accurately in written form; includes study of examples of failure.

Week 8: Dealing with significant figures 1

The uncertainties of measurement values, which are required when evaluating things and matters quantitatively; also, study of significant figures.

Week 9: Dealing with significant figures

The uncertainties of measurement values, which are required when evaluating things and matters quantitatively; also, study of significant figures.

Week 10: Brainstorming

Overview of brainstorming, a method of creative group thinking; practical training in brainstorming using actual topics determined in advance.

Week 11: Special lecture 1

Special lecture by a distinguished external guest speaker involved in monozukuri, providing one example of cutting-edge monozukuri research and development.

Week 12: Special lecture 2

Special lecture by a distinguished external guest speaker involved in monozukuri, providing one example of cutting-edge monozukuri research and development.

Week 13: Group work (straw towers)

Group work involving competing with one another groups of four to create the highest tower made solely out of straws and adhesive tape within an allotted time.

Week 14: Group work (paper bridges 1)

In groups of six, construct a model bridge using only sheets of A4 paper. Make your bridge over a span of several tens of centimeters between desks, and aim to have the bridge that will bear the greatest weight.

Week 15: Group work (paper bridges 2)

In groups of six, construct a model bridge using only sheets of A4 paper. Make your bridge over a span of several tens of centimeters between desks, and aim to create the bridge that will bear the greatest weight.

Then, conduct a self-evaluation of the group work undertaken over the past three weeks.

Week 16: Final examination**Preparation and Follow-up**

- Preparation: Conduct research on the topic for the next class, as announced in the previous class.
- Follow-up: Revise class content and identify points requiring clarification.