

**【Course Title】** Social Systems Modeling

**【Credits】** 2-0-0

**【Instructor】**

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**【Aims and Requirements】**

Mathematical modeling methods and mathematical analysis methods for social systems are presented through lectures and exercises. This lecture gives definitions, examples and analysis methods of games in normal form, games in extensive form, option forms, graph models, simple games, games in characteristic function form, and so on, as models for analyzing decision making situations. Methods of coalition formation analysis and relation analysis are also introduced.

Students are required to prepare and submit three reports: a report on the background and the detail of a real-world decision making situation (Background Report), that on the model of the situation (Model Report) and that on the analysis of the situation (Analysis Report). Also, they are required to prepare and make a presentation based on these reports in the end of the term.

This lecture aims to cultivate the students' ability of selecting an appropriate model for analyzing a focal decision making situation, that of describing a real-world decision making situation by a model, that of analyzing the model and taking out some insights on the situation from the results of the analysis and that of deriving the results of the analysis to others concisely.

**【Schedule and Class room】**

Every Thursday, 15:05-16:35, Room W936

The 1st week (Oct. 4): Lecture plan, Preliminaries on mathematical symbols, Classification of decision making situations

The 2nd week (Oct. 11): Competitive decision making situations 1: Games in normal form

The 3rd week (Oct. 18): Competitive decision making situations 2: Games in extensive form with perfect information

The 4th week (Oct. 25): Competitive decision making situations 3: Games in extensive form with imperfect information

The 5th week (Nov. 1): Competitive decision making situations 4: Option forms

The deadline of the submission of Background Report

The 6th week (Nov. 8): Feedback of Background Report

(No class on Nov. 15)

The 7th week (Nov. 22): Competitive decision making situations 5: Graph models

The 8th week (Nov. 29): Social decision making situations 1: Simple games and committees

The 9th week (Dec. 6): Social decision making situations 2: Games in characteristic function form

The 10th week (Dec. 13): Advanced Analysis Methods 1: Coalition analysis of competitive decision making situations

The deadline of the submission of Model Report

The 11th week (Dec. 20): Feedback of Model Report

The 12th week (Jan. 10): Advanced Analysis Methods 2: Attitude analysis of competitive decision making situations

(No class on Jan. 17 (Monday classes will be given))

The 13th week (Jan. 24): Advanced Analysis Methods 3: A mathematical model of consensus building

The 14th week (Jan. 31): Presentations

The 15th week (Feb. 7): Presentations

The deadline of the submission of Analysis Report

**【Evaluation】**

Through three reports (25% each) and presentation (25%)

**【Comments from the lecturer】**

The instructor hopes the students have ability on mathematical expression and analysis, and interests in social problems.

This course is designated as one of the courses in the Education Program for Service Innovation (<http://www.service-i.titech.ac.jp/>), those in the Education Program for Consensus Building (<http://www.ipcob.org/course/>), and those in the Education Program for Digital Humanities and Technology. The students are recommended to be enrolled in one or more of these Education Programs. Detailed explanations on the enrollment in these courses can be found in each web site. Contact [courses\\_at\\_valdes.titech.ac.jp](mailto:courses_at_valdes.titech.ac.jp) for more inquiry.