

MIM 420E – Logic and Theory of Design, 22381

Course Syllabus | 2019-2020 Spring Semester

Course Day and Hour : Tuesdays, 13:30h - 16.30h
Course Room : 333
Course Credit Local: 3; ECTS: 4
Course Web Site : https://ninova.itu.edu.tr/Ders/11705/Sinif/43544

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Course Assistant/s: none
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Course Description

This elective course aims to establish an overview of the state-of-the-art understanding on what design is and how it works, comparing respective precision and general validity of the existing claims. Some of the treated works are essentially relying on experiment and some on theory. Conclusions from the approaches are analysed with respect to their corroboration with common design experience as well as their compliance with the principles underlying scientific knowledge discovery. In this way, their explanations of the cognitive aspect of design are compared. This aspect refers to the *knowing of relations among the design entities in some architectural context, so that a best design action is taken in that context*. Here the notion of 'best' is addressed by the help of the mathematical concepts of decision variable, design objective, logical inference, optimality and non-dominance. The modern implementations of these concepts are introduced and their implications for design theory and design practice are indicated.

Course Structure and Plan

The course is structured in two parts: The first one addresses the representational bottlenecks traditionally associated with the cognitive phenomenon of design; the second one describes treatments of the bottlenecks using modern computational methodologies.

Course Plan

WEEK	DATE	TOPIC
1	11-Feb	Introduction to the course
2	18-Feb	Analytical representations of design process
3	25-Feb	Empirical studies of design activity
4	03-Mar	Knowledge representation I: Introduction to logic and its role in design
5	10-Mar	Optimization and design
6	17-Mar	Conflicting objectives and the search for best compromise
7	24-Mar	Mid-Term exam
8	07-Apr	Knowledge representation II: transparency versus complexity
9	14-Apr	Contemporary design methodologies
10	21-Apr	Computer-aided design versus computational design
11	28-Apr	Representational bottlenecks as to the intuitive component of design process
12	05-May	Workshop and case study I: computational representation of design reasoning
13	12-May	Workshop and case study II: computational representation of design reasoning, continued
14	19-May	On implications of modern design theory for design education and architectural practice

Recommended Readings

Texts that will be treated during the course

1. Simon, H.A.: The sciences of the artificial - third edition. The MIT Press, Cambridge, Massachusetts (1996); Chapter 5
2. Schön, D.A.: The reflective practitioner. Basic Books, New York (1983); Chapter 3 (76-104)
3. Hatchuel, A., Le Masson P., Reich Y., Subrahmanian E.: Design theory: A foundation of a new paradigm for design science and engineering. Res Eng Design 29(5), 5-21 (2018)
4. Goldschmidt, G.: Linkography. Design thinking, design theory. The MIT Press, Cambridge, Massachusetts (2014); part of Chapter 3 (47-52)
5. Cross, N.: Design thinking - understanding how designers think and work. Berg, New York (2011); Chapter 4 (66-77)
6. Dorst, K.: Frame innovation - create new thinking by design. Design thinking, design theory. MIT Press, Cambridge, Massachusetts (2015); First part of Chapter 3 (41-55)
7. Alexander, C.: A pattern language. Oxford University Press, New York (1977); Introduction (x-xvii)

Note: Multiple excerpts of the listed readings will be made available to you via the rubric course resources on Ninova. You have no right to copy or distribute these documents and programs or to utilize them beyond their designated purpose; this purpose is restricted to your personal education in the context of this course.

Term project assignment:

Comparative analysis of the performance of two architectural designs, based on a computational representation of the reasoning that underlies the performance evaluations

Course Assessment

Grading components

1. Mid-term Exam: 50 % of the course grade
2. Final Project: 50 % of the course grade

For final project submission policy, please also see: http://www.sis.itu.edu.tr/tr/sinav_programi/ekSinavHakkiDuyuru.html . The minimum mid-term grade to avoid failure (VF) and to earn the right to submit the final project is to get a grade that is at least 30 % of the Course Mark in the mid-term exam. Also, see the course attendance policy below for additional conditions as to avoiding VF.

The mid-term exam will be in written form and cover all the subjects treated in the lectures from the beginning of the term until the date of the exam. The criterion for the grade is the depth of your understanding of the concepts involved in design theory.

3 Communication

Announcements will be posted on the course website with the URL given above. It is the student's responsibility to check the website and also his/her ITU and Ninova registered email inboxes frequently enough to be able to follow the requirements described in the announcements in a timely manner.

4 Plagiarism

University policy prohibits plagiarising any material, and this particularly applies to students. In case a student presents the thoughts or works of another person as his/her own, this constitutes plagiarism and is penalized as stipulated by the university policy¹. Plagiarism may include, but is not limited to:

1. copying or paraphrasing material from any source without due acknowledgment,
2. using another's ideas without due acknowledgment
3. working with others without the instructors' permission and presenting the resulting work as though it was completed individually

Plagiarism is not only related to written works, but applies also to other expressions of human intellect and forms of intellectual property; including images, drawings, models, music, mathematical expressions, web-content, computer programs, collected data, and so on. Aiding another student to plagiarize is also a violation of the plagiarism policy and may invoke a penalty.

5 Attendance

Attendance to all lectures is mandatory. Absence in circumstances beyond the student's control is acceptable up to a maximum of 4 lecture/lab days, while the attendance in week number 1 is not counted. Exceeding the limit implies VF grade.

Note that signing in the place of another student constitutes a document fraud, which is a severe violation of ethical norms that cannot be tolerated.

A student entering the class room late manifests disrespect towards his/her fellow students, as he/she interrupts their knowledge assimilation to some extent. Entering the room excessively late, i.e. entering it later than 40 minutes after 8:30h, implies he/she has already missed more than 30% of the lecture content, so that he/she loses the right to be registered as having attended the lecture. The same loss of rights occurs when a student leaves the lecture significantly earlier than 11.30h. The instructor may take attendance at any time during a lecture or a lab lesson; yet, it is the responsibility of the student to verify before the lesson end that his/her attendance is duly registered. Viewing content on a mobile device, including reading or writing text messages, during the class and outside of a lesson break, implies non-attendance of the course for the duration of the communication. The same applies for sleeping during the lecture. Clearly it is problematic to estimate the duration such an event by an observer who is not engaged in constantly monitoring the audience' behaviour. Therefore the condition, a student holds a mobile device in his/her hands while the lesson takes place has to be deemed sufficient evidence that he/she was not attending the lecture, implying that he/she loses the right for registering his/her attendance.

¹ *For further information on the university's policy on plagiarism and the associated sanctions, refer to the university web-site. For instance, plagiarism in the context of an examination ('cheating') is to be sanctioned by expelling the student from the university for an extended time period.