

## Data Sheet of International Master's Courses CAUP, Tongji

### 同济大学建筑与城市规划学院研究生国际课程(英语)登记表

Course Code 课程编号	2010365	Department 所在系(√)	A	P	L	D	院登记号 CAUP Code	
Instructor(Title) 主讲教师(职称)	Prof. Yuan Feng 袁烽 教授	Other Teachers 合作教师	√					
课程中文名	数字建筑学的理论、历史与方法讨论							
Course Name (E)	Advanced Debate on Theory, History and Methodology of Digital Architecture							
Form of Teaching 教学形式 (√)	Lectures 讲课	Design Studio 设计课	Seminar 研讨课		Internship 实践课		Others 其他	
	√		√					
Total Hours 总学时数	36	Hours per Week 周课时	2		Weeks 教学周数		18	
Semester 春季或秋季学期	Fall 秋季	Tongji Credits 同济 学分数	2					

#### Brief Course Description 课程简述 (中英文)

## Introduction

### 课程介绍

“数字建筑学的理论、历史与方法讨论”为面向建筑设计及理论、建筑历史与理论、建筑技术科学各专业硕、博士研究生的选修课程。课程目的在于使学生了解当代数字化建筑转型背后的历史发展脉络与哲学理论基础，并在此基础上帮助学生重新建立起对数字化设计建造方法、工具及社会生产意义的全新理解。

课程大纲包括：

- 1) 数字转型的历史与理论，以时间为线索对上世纪 90 年代开始的数字转型进行梳理，并着重讨论艾森曼与格雷戈·林恩的“褶皱”概念、生成性设计与集群智能、参数化主义等重要思想；
- 2) 数字建筑的哲学思辨，将重点分析引发建筑数字化转型的哲学思想基础，包括新唯物主义、虚拟性、拓扑思维、非线性概念等；
- 3) 数字设计的性能化方法，指向当今建筑学中形式与性能的重要议题，通过对结构性能、环境性能及行为性能三个方面的展开，探讨数字设计方法论在其中的实践意义；
- 4) 数字建造的社会性生产，以建筑信息模型与机器人建造平台为研究客体，深入探索数字化建造方式带来的异质性对后工业时代的社会生产模式产生的影响。

“Advanced Debate on Theory, History and Methodology of Digital Architecture” is an optional course for all the master and doctor students majoring in Architecture Design and Theory, Architecture History and Theory, and Architecture Technology and Science. By introducing the historical lineage and philosophical theory of architectural digital turn to the students, the aim of this course is to help them to establish a new interpretation on the method, tool and social relevance of digital design and fabrication.

The outline of the course will include four aspects:

- 1) theory and history of architectural digital turn, in which theoretical thinkings such as “Folding in Architecture”, “generative design and collective intelligence” and “Parametricism” will be mainly addressed based on a historical sequence.
- 2) philosophical speculation of digital architecture, in which the relation between digital design and philosophical concepts, like New Materialism, Virtuality, Topological Space and Non-linear, will be critically analyzed.
- 3) performance based design methodology, in which the concept of performative geometry will be unfolded into structural, environmental and behavioral aspects, and then examined in terms of their practical influence.
- 4) digital fabrication and social productivity, in which the platforms of BIM and robot will be introduced to explore their impact on the reorganization of social network in post-industrial world.

### 教学目标与要求:

#### (Course Objective and Requirement)

课程目的在于使学生了解当代数字化建筑转型背后的历史发展脉络与哲学理论基础,并在此基础上帮助学生重新建立起对数字化设计建造方法、工具及社会生产意义的全新理解。

课程要求学生根据授课内容的指导进行广泛阅读,并围绕“数字化建筑”进行特定课题的选取与研究,最终成果将以课程汇报与讨论的形式进行。

By introducing the historical lineage and philosophical theory of architectural digital turn to the students, the aim of this course is to help them to establish a new interpretation on the method, tool and social relevance of digital design and fabrication.

In the course, the students will be asked to accomplish readings on various subjects within the course outline, and then to choose and conduct their particular research topic under the instruction of professor. The final production will be on the format of class presentation and discussion.

### 课程内容与学时分配:

#### (Course Schedule (Content and Contact Hours Assigned))

- (一) 数字转型的历史与理论 (10 课时)
  1. 导论: 艾森曼与数字建筑萌芽
  2. 格雷戈·林恩建筑的“褶皱” 1993
  3. 生成性设计 2004-2006
  4. 集群智能 2006
  5. 参数化主义 2009
- (二) 数字建筑的哲学思辨 (4 课时)
  6. 德勒兹与新唯物主义
  7. “非线性”与拓扑学奇点
- (三) 数字设计的性能化方法 (12 课时)
  8. 形式与结构性能
  9. 结构性能化的算法生形
  10. 形式与环境性能
  11. 环境性能化的算法生形
  12. 形式与行为性能
  13. 行为性能化的算法生形
- (四) 数字建造的社会性生产 (6 课时)
  14. 参数化几何的建模与优化

15. 信息流动与数字化建造
16. 机器人与社会生产模式

课后学习+讨论（4 课时）

Chapter 1: History and Theory of digital turn（10 class hour）

- 1.Introduction: Peter Eisenman and seed of digital architecture
2. Greg Lynn and folding architecture
3. Generative design
4. Swarm intelligence
5. Parametricism

Chapter 2: philosophical debate on digital architecture（4 class hour）

6. Gilles Deleuze and new materialism
7. “non-linear” and Topological singularity

Chapter 3: Performative Design Methodology of Digital Design（12 class hour）

8. Structural Performance and Form
9. Form generation based on structural performance
10. Environmental Performance and Form
11. Form generation based on environmental performance
12. Behavior performance and Form
13. Form generation based on behavioral performance

Chapter 4: Social production of digital fabrication（6 class hour）

14. modelling and optimization of parametric geometry
15. Information flow and digital construction
16. Robotics and social production

After-class learning and discussion（4 class hour）

**教材（Textbook）：**

- 袁烽 《从图解思维到数字化建造》 同济大学出版社，2016年  
袁烽 《建筑机器人建造》 同济大学出版社，2015年  
袁烽 《建筑数字化编程》 同济大学出版社，2012年  
袁烽 《建筑数字化建造》 同济大学出版社，2012年

**主要参考书（References）：**

- 1、 Mario Carpo. Architectural Design: The Digital Turn in Architecture 1992-2002. 2013
- 2、 Peter Eisenman, Diagram Diaries, Universe Publishing: NY, 1999
- 3、 Greg Lynn. Architectural Design: Folding in Architecture. 1993
- 4、 Manuel DeLanda. A Thousand Years of Nonlinear History[M]. New York: Swerve Editions. 2000
- 5、 Manuel DeLanda. Deleuze and the Use of Genetic Algorithms in Architecture[J]. Architectural Design: Designing

for a Digital World. 2002

- 6、Manuel DeLanda. Material Complexity[G]//Neil Leach, David Turnbull, Chris Williams. Digital Tectonics. Wiley-Academy Press. 2004
- 7、Gilles Deleuze& Felix Guattari. A Thousand Plateaus, Capitalism and Schizophrenia[M]. Massumi, Brian trans. Minneapolis: University of Minnesota Press. 1987
- 8、John Frazer. A Natural Model for Architecture[J]. Architectural Design: Computational Design Thinking. 2011
- 9、Sanford Kwinter. Architecture of Time: Toward a Theory of the Event in Modernist Culture[M]. Cambridge: The MIT Press. 2001
- 10、Sanford Kwinter. The Computational Fallacy[J]. Architectural Design: Computational Design Thinking. 2011
- 11、Greg Lynn. Animated Form[M]. New York: Princeton Architectural Press. 1999
- 12、Nicholas Negroponte. Being Digital[M].New York: Alfred A. Knopf. 1995
- 13、Gordon Pask. The Architectural Relevance of Cybernetics[J]. Systems Research, Vol 10, No. 3. 1993
- 14、Antoine Picon. Architecture and the Virtual: Towards a New Materiality[J]. Praxis 6. 2004. 114-121
- 15、Jesse Reiser, Nanako Umemoto. Atlas of Novel Tectonics[M]. New York: Princeton Architectural Press. 2006
- 16、Kostas Terzidis. Algorithmic Architecture[M]. London: Architectural Press. 2006
- 17、Mario Carpo. The Alphabet and the Algorithm[M]. Cambridge: The MIT Press. 2011
- 18、Karl Chu. Metaphysics of genetic architecture and computation[J]. Architectural Design: Programming Cultures. 2006. 38-45
- 19、Michael Hays. Architecture by Numbers[J]. Praxis 7. 2005
- 20、Mark Garcia, The diagrams of architecture, John Wiley & Sons Ltd, 2010