Design Studio III:  Operational

Hanging model for the crypt of Colònia Güell. Antoni Gaudi, 1898-1915
Overview

General Information

University of Texas at Austin School of Architecture

Schedule:  Mondays  1pm – 5:30pm
Wednesdays  1pm – 5:30pm

Location:  SUT 4.106, SUT 4.108, SUT 4.124

Instructors:  Aleksandra Jaeschke, Coordinator, email: jaeschke@austin.utexas.edu
Kory Bieg, email: kory@otaplus.com
Suhash Patel, email: suhash019@gmail.com
Kevin Sullivan, email: kev.m.sullivan@gmail.com

Office Hours:  by appointment

Prerequisites  ARC 310L and 311L with a grade of at least C in each
Registration for Architecture 221K or Architectural Interior Design 221K

Curriculum Flag: Independent Inquiry
This course carries the Independent Inquiry flag. Independent Inquiry courses are designed to engage students in the process of inquiry over the course of a semester, providing a student with the opportunity for independent investigation of a question, problem, or project related to the student’s major. At least one-third of the grade will be based on independent investigation and presentation of one’s own work.

Intermediate Design Studios
Students pursuing the Bachelor of Architecture must complete four Intermediate Design Studios during their second and third years. Building on the Foundation Design Studios taken during the first year, the goal of the Intermediate Studios is to prepare students for Advanced Design Studios in their fourth and fifth years. Each Intermediate Studio is structured around one of four broad themes of inquiry: Operational, Environmental, Integrative, and Speculative. The aim of each studio is to establish a critical framework and suggest a range of design tools relevant to the key issues addressed as part of each broad theme. Intermediate Studios also serve as a platform to prepare students for the range of offerings of the Advanced Studios (e.g. Comprehensive, Urban Design, Landscape Architecture, etc.). Intermediate Studios follow a similar structure, but instructors individually determine the exact scope of each design studio.
Learning Outcomes

Students will be exposed to a series of learning goals several times and from different angles over the four Intermediate Studio sequence. The goal is that similar issues are repeated from studio to studio but from different angles, allowing students to find, within the diversity of the topics, a “common thread” as they go through the sequence of the four studios. The level of expectation will grow as students go from being introduced to an issue, to becoming competent at it. Some issues would be only mentioned in passing in one studio but will be studied in more depth in another:

- **Design Composition Skills**: Developed through three-dimensional architectural form and space, both exterior and interior; building envelope;
- **Design Integration Skills**: Demonstrated through creative engagement with issues of materiality, structures, construction, and environmental system;
- **Site Analysis and Design**: Developed through the creative engagement with relevant contextual; environmental and programmatic factors underlying the project;
- **Basic grasp of accessibility and egress**;
- **Critical Thinking**: Quality of conceptual and critical thought; learning from precedents; research skills;
- **Graphic Skills**: Quality of presentation; clarity of communication; appropriateness of media strategy and level of skill displayed;
- **Collaborative and Leadership Skills**: Demonstrated through the active engagement in all activities of the studio.

Design Conversations: Jessen Lectures

The School of Architecture offers a wide range of opportunities for students to extend the design conversations taken place in studios (Lecture Series, Goldsmith Talks, Exhibitions, etc.). Students are encouraged to participate and be engaged. Specifically, all BArch and BSAS students in studio are expected to attend all the Jessen Lectures (three per semester by lead practitioners from around the world). The lectures and the group discussions in studio that follow are important for the holistic education of intellectually engaged students and participation will have an impact on students’ grades (see below).
Overview

Studio Theme: Operational

“Architecture’s relationship to its material is (…) indirect. Unlike activities such as gardening or woodworking, where something concrete is made by direct contact with the material, the architect (like the engineer, the urbanist, or the ecologist) operates on reality at a distance, and through the mediation of abstract systems such as notation, projection, or calculation. Indirect contact is the necessary counterpart to the larger scale of intervention. Architecture works simultaneously with abstract images and with material realities, in complete interplay. It is a material practice.”


“1. There are two ideas hidden in the word system: the idea of a system as a whole and the idea of a generating system. (…) 2. A system as a whole is not an object but a way of looking at an object. It focuses on some holistic phenomenon which can only be understood as a product of interaction among parts. (…) 3. A generating system is not a view of a single thing. It is a kit of parts, with rules about the way these parts may be combined. (…) 4. Almost every ‘system as a whole’ is generated by a generating system. If we wish to make thinks which function as ‘wholes’ we shall have to invent generating systems to create them. (…)”


operation (ˈopəˈreɪʃən) n.
- the act, process, or manner of operating, especially of a practical or mechanical nature;
- a process or series of acts involved in a particular form of work: the operations of building a house;
- (mathematics) a process or action, such as addition, substitution, transposition, or differentiation, performed in a specified sequence and in accordance with specific rules;
- (computing) an action resulting from a single instruction.

operational (ˈopərəˈrāʃən) adj.
- pertaining to a process or series of actions for achieving a result.

Relations: Operations and Procedures
The studio focuses on formal operations, their spatial and functional consequences, and experiential as well as aesthetic effects. Form will be understood as an expression of internal orders and organizations and not as an arbitrarily-conceived shape. The studio is essentially concerned with the invention and control of generative systems and with ways in which they can be expressed, spontaneously explored, rigorously controlled, and implemented (digitally and materially) in the process of conceiving new built forms.

Practical operations constitute an intrinsic part of the act of building. After all, any goal-oriented act requires execution of clear and well-defined operations, especially when the relationship between the thinker and the ultimate product of their
thought – the building - is indirect and mediated. Yet, the operational, or system-based, design methods did not emerge yesterday either. Their theoretical and practical roots are almost a century old, they go back to the organismic thought developed in the 1920s. It was later, in the post-war period, that advances in systems theory, cybernetics, and computation triggered the first wave of radical experiments in design processes. Ultimately, the 1990's academia and research-driven practices contributed the diagram - a powerful device capable of ordering information and driving its evolution towards material organization. In parallel to the cybernetic agenda, a continued fascination with natural sciences and a growing ecological awareness inspired research into biomimetic design strategies. Logics of morphogenesis, growth, and evolution in organisms and ecosystems provided models for artificial systems and design processes.

Diagrams: Generative Systems
During the 1990s, and thanks to the work of Michel Foucault and Gilles Deleuze, the diagram, commonly understood as a form of representation of information used to visualize and analyze problems, assumed a new role. It was transformed into a powerful structuring device capable of ordering information and driving its evolution towards material organization. As Sanford Kwinter points out in the forward to Reiser+Umemoto's *The Atlas of Novel Tectonics*: “The diagram is an invisible matrix, a set of instructions, that underlies – and most importantly organizes – the expression of features in any material construct” (2006, 12). While in the 1960s, the mathematician / architect, Christopher Alexander explored diagram-based design methods to systematize design requirements and synthesize formal organizations from them, the power of the diagram, as theorized in the 1990s, lies in its capacity to migrate. In other words, a diagram not always emerges from a problem, it can be extrapolated from one material organization to organize another material field. Think of how ubiquitous branching systems are and how many different roles they fulfill! As Reiser+Umemoto point out: “A close tracking of a certain dynamic (...) can be abstracted from its origins or its material source. A diagram of relationships, not of scale emerges. Or, more precisely, the diagram is a field of relationships awaiting a scale and materiality” (2006, 116). While abstract generative diagrams and operational procedures can help introduce spatial and functional novelty and give new forms to old problems, they are not deprived of risk. The success relies on two skills: a capacity to operate both through a top-down imposition of orders and a bottom-up engagement with local relationships; and an ability to maintain flexibility to allow for a gradual evolution of the diagram in response to external requirements and constraints. In this studio we will explore and practice these skills.

Computation: Parametric Design and Numerically-Controlled Fabrication
While the work of Antoni Gaudi offers a spectacular example of material computation, a system-based approach to complex design problems would have remained a daunting task for most architects without the opportunities offered by digital computation systems, specifically parametric design tools and numerically-controlled fabrication. A parametric (or relational) design approach is one in which the designer defines initial elements and relationships between them; where each element is a product of a set of parameters (or variables) that exist within a range, and under a defined set of rules and constraints. Next to many design opportunities, thinking of spatial organizations as systems of relations, as opposed to discrete objects also brings practical benefits. Architects can layer complexity into a design without having to re-coordinate an entire set of drawings every time a change is made. Also, as digital fabrication technologies advance, we are no longer limited by mass manufacturing. Parts can differentiate across a surface while adjusting to extremely local conditions imposed by the context. Or, parts can be altogether unique from one to the next. Their definition can also be directly transferred to numerically-
controlled fabrication devices. Thanks to the digital, the highly-mediated design process becomes a little bit more immediate again. Ubiquitous and seamlessly interconnected with the material world, the digital systems of production continue to affect how we design buildings and what social, cultural, and aesthetic ideas we project out into the real world. In this studio, we will fully embrace them.

**Organization: Rules and Intuition**

During this semester we will adopt a step-by-step approach to generate cohesive, although not deprived of surprises - organizations from assemblages of interrelated parts. We will work on locally-defined operations and globally-controlled organizations. Each part will exist within a network of relations that evolves together with the project. Each element will be linked to the others through a set of internal rules. These local rules will guide the evolution of the whole. The project will be in a constant state of flux as new issues find their way to the forefront: a change to either part or whole will have a ripple effect throughout the project. By building relationships from the bottom-up, students will develop an intimate understanding of the mechanics of their project, yet have the freedom to use their intuition and improvise within the bounds of a rule-based framework to maintain operative flexibility, and to develop their own personal sense of aesthetic. You will oscillate between bottom-up tactics and top-down strategies, balancing an intuitive approach with a rule-based methodology.

Remember, multiple diagrams can organize one problem. It will be up to each of you to develop your own set of rules, your own generating system, your own organization. Act spontaneously and with rigor.
Overview

Studio Road Map

Structure
The semester will be divided into three interconnected parts / assignments:

• Assignment 01: Operations (Learning from a Precedent)
The first assignment will focus on the analysis of a built precedent. Students will learn how to analyze a formal system to extrapolate underlying rules and operational logics, diagram them using a consistent notation, and manipulate the rules to generate iterations of new organizations from them. This work will be developed in groups of two.

• Assignment 02: Organizations (Making a Spatial Construct)
The second part of the semester will be dedicated to the design and making of a three-dimensional physical construct. Students will deploy the previously developed rules and iterations in a 3D region. Here we will explore intuitive and rule-based design methods to develop flexible and more complex spatial diagrams. This work will be developed individually.

• Assignment 03: Contingencies (Designing a Building)
The rest of the semester will be dedicated to your final project, a building located in an urban context. Students will continue working with the operations and diagrams developed during the previous assignments, but this time they will be asked to respond to the requirements posed by the programmatic brief and urban context. In this phase, we will explore the flexibility of your systems and test their capacity to organize human activities. You will continue to work individually.

While manual model-making and hand-drawn diagrams will continue to be an integral part of your design process, the studio will rely on digital technologies, design software packages and fabrication hardware, for the development and execution of projects. Students will be encouraged to use new tools for the design and fabrication of complex forms, but will be expected to consider the limitations imposed by materials and assembly methods, both when working on models and thinking about their final projects.

Instruction will be given via desk-crits, group pin-ups, and reviews. We will also have group presentations and discussions focused on the key issue addressed during the semester.

Assessment
Students are expected to participate in all activities and comply with all the requirements for the length of the semester. There are four components to the grade:

1. Assignment 01: Research & Analysis (in pairs) 15% of final grade
2. Assignment 02: Embedded Construct (individual) 20% of final grade
3. Assignment 03: Main Studio Project (individual) 60% of final grade
4. Engagement 05% of final grade
## Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>August 28</td>
</tr>
<tr>
<td>00</td>
<td>September 02</td>
</tr>
<tr>
<td>02</td>
<td>September 04</td>
</tr>
<tr>
<td>03</td>
<td>September 09</td>
</tr>
<tr>
<td>04</td>
<td>September 11</td>
</tr>
<tr>
<td>05</td>
<td>September 16</td>
</tr>
<tr>
<td>06</td>
<td>September 18</td>
</tr>
<tr>
<td>07</td>
<td>September 23</td>
</tr>
<tr>
<td>08</td>
<td>September 25</td>
</tr>
<tr>
<td>09</td>
<td>September 30</td>
</tr>
<tr>
<td>10</td>
<td>October 02</td>
</tr>
<tr>
<td>11</td>
<td>October 07</td>
</tr>
<tr>
<td>12</td>
<td>October 09</td>
</tr>
<tr>
<td>13</td>
<td>October 14</td>
</tr>
<tr>
<td>14</td>
<td>October 16</td>
</tr>
<tr>
<td>15</td>
<td>October 21</td>
</tr>
<tr>
<td>16</td>
<td>October 23</td>
</tr>
<tr>
<td>17</td>
<td>October 24</td>
</tr>
<tr>
<td>18</td>
<td>October 28</td>
</tr>
<tr>
<td>19</td>
<td>October 30</td>
</tr>
<tr>
<td>19</td>
<td>November 04</td>
</tr>
<tr>
<td>20</td>
<td>November 06</td>
</tr>
<tr>
<td>21</td>
<td>November 11</td>
</tr>
<tr>
<td>22</td>
<td>November 13</td>
</tr>
<tr>
<td>23</td>
<td>November 18</td>
</tr>
<tr>
<td>24</td>
<td>November 20</td>
</tr>
<tr>
<td>25</td>
<td>November 25</td>
</tr>
<tr>
<td>27</td>
<td>December 02</td>
</tr>
<tr>
<td>27</td>
<td>December 04</td>
</tr>
</tbody>
</table>

Please, note that the final reviews will take place on December 04, 05, 06. Your review may be scheduled for any of these days and you are expected to be on campus during this period.
Resources

Essential Readings

Foreign Office Architects, *Phylogenesis, foa's ark* (Actar, 2003), pp.06-19, …

General References


Online Tutorials

www.cgarchitect.com (forum help for 3ds Max and rendering)
www.scriptsroot.com (free 3ds Max scripts)
www.vray-materials.de (free VRay materials)
www.shapeways.com (cheap 3d printing, expect one-month lead time)
www.archive3d.net (free 3d models)
www.grasshopper3d.com (great forum, GH plug-ins, tutorials)
www.food4rhino.com (GH plug-ins)
www.lynda.com (good tutorials, all programs, free with UT email address)
Procedures

Evaluation & Policies

Studio Culture
The School of Architecture believes in the value of the design studio model. Studio learning encourages dialogue, collaboration, risk-taking, innovation, and learning-by-doing. The studio offers an environment where students can come together to ask questions and make proposals, which are developed and discussed among classmates, faculty, visiting professionals, and the public-at-large. Studio learning offers intensive one-on-one instruction from faculty members, and provides the opportunity for each student to develop his/her critical thinking skills and spatial and material sensibilities. The design studio offers a synthetic form of education, where project-based learning becomes the foundation for developing an understanding of and commitment to the school’s core values — broadmindedness, interconnectivity, professionalism, exploration and activism — all in service of architecture’s fundamental mission: to improve the quality of the built and natural environments.

https://soa.utexas.edu/programs/architecture/architecture-studio-culture

Security, Safety, and the Studio
The studio is an exceptional learning environment. Since it is a place for all, it necessitates the careful attention to the needs of everyone. All spraying of fixative, spray paint, or any other substance should be done in the shop. Security is a necessary component for a studio that is accessible to you and your colleagues 24 hours a day, 7 days a week. Do not leave your studio without your studio key and do not leave your studio unlocked. Hold yourself and your studio mates accountable for the security of your shared space.

General Culture
Being on time is required. Participation is expected. Asking questions is highly encouraged. We want to have an open and engaging conversation and a productive time. Laptops can only be used for studio work. Texting and eating are distracting and disrespectful. Drinks are fine, stay hydrated! Please, step out if you have to make an emergency call.

Communication & Submissions: Canvas & Emails
Canvas will be used for communication of the logistics and content of the course, as well as for submission of assignments, feedback, grading, and attendance. Direct emails will be used for one-to-one communication. Please, set up your Canvas preferences to receive a notification as soon as a Canvas Announcement has been posted. Make sure that the email you provided on Canvas is active and that you regularly check your inbox.

Course Requirements
Students are required to have a laptop computer that is capable of running high-performance 2d and 3d software applications (Adobe Illustrator, Adobe Photoshop, Rhino, Grasshopper, and Autodesk 3ds Max, etc.). All programs should be
2018 versions of later. Note regarding Adobe software: When accessing Adobe software in SOA computer labs, you will be prompted to sign in with an Adobe ID. You are not required to purchase Creative Cloud services to sign in on our lab computers, but you are required to create a free Adobe ID. That can be done here: https://accounts.adobe.com/

Weekly progress and participation in class pin-ups, desk crits, and reviews is required, including completion of assigned readings and participation in discussions. Students are expected to have new work printed (min. 8.5” x 11”) for each desk crit and plotted at the required scale for pin-ups and reviews.

The submission of high-quality final renders (jpeg format), progress renders, 3d digital models, final boards, full documentation of project and design process and high-quality photographs of your models on a flash drive is mandatory.

Failure to submit flash drive on the final day of class will result in a minimum full letter grade drop in your final grade for the course.

Evaluation Criteria

While each project contains certain quantifiable elements for evaluation, a significant portion of each grade is derived from broader and more subjective criteria. Student work will be evaluated according to its rigor and evolution over the semester.

Grades are subject to deductions for late arrivals, absences, and late or incomplete work at the discretion of the instructor.

Grading for an assignment is broken into four components, each of which is given roughly equal weight:

- **Pursuit:** Consistent and rigorous development and testing of ideas:
  - The ability to formulate a query or thesis and pursue a self-determined concomitant method of inquiry;
  - The ability to identify and implement various processual mechanisms (software, sketch drawing and models, etc.) in the development of the design;
  - Initiative as demonstrated in work ethic: Does the student do what is asked; go beyond what is asked; direct their own efforts; show eagerness to produce the next iteration of the design?

- **Grasp:** Understanding of the project and integration of knowledge introduced in companion courses:
  - A strong and clearly stated design objective;
  - Spatial acuity as demonstrated in plan – including reasonable disposition of programmatic elements – and sectional development;
  - Synthetic and critical thinking; the ability to holistically organize a project as demonstrated through creative engagement with issues of materiality, structures and construction, structural and environmental system integration, building materials and assembly, sustainable practices, etc. in support of the design objective;
  - Structural competence and material sensitivity as demonstrated in wall thickness, floor plates, and assembly.

- **Resolution:** Demonstration of competence, completeness, and finesse in the final design presentation:
  - Quality of presentation; clarity of communication; appropriateness of media strategy and level of skill displayed through the work presented at all stages of the design process; technical documentation.

- **Engagement:** Active participation in studio activities, group discussions and reviews, leadership, and collaboration.
A student must earn a letter grade of C or better in order for the course to count towards a degree in the School of Architecture and to progress into the next studio. A letter grade of C- will not satisfy degree requirements.

Grade Description

- **A/A- Excellent**
  Project surpasses expectations in terms of inventiveness, appropriateness, visual language, conceptual rigor, craft, and personal development. Student pursues concepts and techniques above and beyond what is discussed in class. Project is complete on all levels.

- **B+/B/B- Above Average**
  Project is thorough, well presented, diligently pursued, and successfully completed. Student pursues ideas and suggestions presented in class and puts in effort to resolve required projects. Project is complete on all levels and demonstrates potential for excellence.

- **C+/C Average**
  Project meets the minimum requirements. Suggestions made in class and not pursued with dedication and rigor. Project is incomplete in one or more areas.

- **C-/D+/D/D- Poor**
  Project is incomplete. Basic grasp of skill is lacking, visual clarity or logic of presentation are not level-appropriate. Student does not demonstrate the required competence and knowledge base.

- **F Fail**
  Project is unresolved. Minimum objectives are not met. Performance is not acceptable. Note that this grade will be assigned when students have excessive unexcused absences.

- **X Excused Incomplete**
  Can be given only for legitimate reasons of illness or family emergency. Simply not completing work on time is not an adequate cause for assigning this evaluation. It may only be used after consultation with the Associate Deans' offices and with an agreement as to a new completion date. Work must be completed before the second week of the next semester in which the student is enrolling, according to the School of Architecture policy.

Attendance

Attendance is mandatory. Participation is expected. With three (3) unexcused absences, the student’s final grade for the course will be lowered by a full letter grade. The final grade will be lowered by a full letter grade for each unexcused absence thereafter. Aside from religious observances, absences are only excused with written documentation of a medical issue or family emergency. The student is responsible for completing work missed due to excused absences and initiating communication with the instructor to determine due dates. If a student is late (10 minutes after the start of class) three (3) times, it will be counted as one (1) unexcused absence. Students should notify the instructor via email prior to class if lateness or absence is known in advance.
Religious Observances
A student shall be excused from attending classes of other required activities, including examinations, for the observance of a religious holy day, including travel for the purpose. A student whose absence is excused under this subsection may not be penalized for that absence and shall be allowed to take an examination or complete an assignment from which the student is excused within a reasonable time after the absence. University policy requires students to notify each of their instructors as far in advance of the absence as possible so that arrangements can be made.

Academic Integrity
Students who violate University policy on academic integrity are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on academic integrity will be strictly enforced. Refer to the Student Conduct and Academic Integrity website for official University policies and procedures on academic integrity:
http://catalog.utexas.edu/general-information/the-university/#universitycodeofconduct

Care Program
Counselors in Academic Residence (CARE) Program places licensed mental health professionals within the colleges or schools they serve in order to provide better access to mental health support for students who are struggling emotionally and/or academically. Abby Simpson is the CARE counselor for the School of Architecture. Faculty and staff may refer students to the CARE counselor or students may directly reach out to her.
Abby Simpson | BTL 114B | (512) 471-3115
https://cmhc.utexas.edu/CARE_simpson.html

Students with Disabilities
Students with disabilities who require special accommodations need to obtain a letter that documents the disability from the Services for Students with Disabilities area of the Office of the Dean of Students (471-6259 voice or 471-4641 TTY for users who are deaf or hard of hearing). This letter should be presented to the instructor in each course at the beginning of the semester and accommodations needed should be discussed at that time. http://diversity.utexas.edu/disability/