UNIVERSITY OF TENNESSEE

Interim Progress Report for Year Five

Instructions and Template

November 27, 2019

Contents

1. Instructions and Template Guidelines

2. Executive Summary of the Two Most Recent NAAB Visits: 2008 and 2014

3. Template

   a. Progress in Addressing Not-Met Conditions and Student Performance Criteria identified in the review of the Interim Progress Report for Year 2

   b. Progress in Addressing Causes of Concern

   c. Changes or Planned Changes in the Program

   d. Summary of Responses to Changes in the 2014 NAAB Conditions

   e. Appendix (include revised curricula, syllabi, and one-page CVs or bios of new administrators and faculty members; syllabi should reference which NAAB SPC a course addresses; samples of required student work).

1. INSTRUCTIONS AND TEMPLATE GUIDELINES

Purpose

Continuing accreditation is subject to the submission of interim progress reports at defined intervals of 2 years and 5 years after an eight-year term of continuing accreditation is approved.

This narrative report, supported by documentation, covers four areas:
1. The program's progress in addressing not-met Conditions and Student Performance Criteria (SPC) from the Interim Progress Report Year 2 review.
2. Progress in Addressing Causes for Concern.
3. Changes or Planned Changes in the Program.
4. Summary of Responses to Changes in the 2014 NAAB Conditions.

Supporting Documentation

1. The narrative should describe in detail all changes in the program made in response to not-met Conditions and Student Performance Criteria, including detailed descriptions of changes to the curriculum that have been made in response to not-met SPC that were identified in the review of the Interim Progress Report Year 2. Identify any specific outcomes expected to student performance. Attach new or revised syllabi of required courses that address unmet SPC.
2. Evidence of student work is only required to address deficiencies in the following cases: (1) If there are any SPCs that have not been met for two consecutive visits; (2) If there are three not-met SPCs in the same realm in the last visit.
   Provide three examples of minimum-pass work for each deficiency and submit student work evidence to the NAAB in electronic format. (Refer to the "Guidelines for Submitting Digital Content in IPRs" for the required format and file organization.)
3. Provide information regarding changes in leadership or faculty membership. Identify the anticipated contribution to the program for new hires and include either a narrative biography or one-page CV.
4. Provide additional information that may be of interest to the NAAB team at the next accreditation visit.

Outcomes

IPRs are reviewed by a panel of three: one current NAAB director, one former NAAB director, and one experienced team chair.[1] The panel may make one of three recommendations to the Board regarding the interim report:
1. Accept the interim report as having demonstrated satisfactory progress toward addressing deficiencies identified in the report of the Interim Progress Report Year 2.
2. Accept the interim report as having demonstrated progress toward addressing deficiencies but require the program to provide additional information (e.g., examples of actions taken to address deficiencies). This report shall be due within six weeks of the receipt of this outcome report.
3. Reject the interim report as having not demonstrated sufficient progress toward addressing deficiencies and advance the next accreditation sequence by at least one calendar year, thereby shortening the term of accreditation. In such cases, the chief academic officer of the institution will be notified and a copy of the decision sent to the program administrator. A schedule will be determined so that the program has at least six months to prepare an Architecture Program Report. The annual statistical report (see Section 9 of the 2014 Conditions) is still required.

Deadline and Contacts

IPRs are due on November 30. They shall be submitted through the NAAB's Annual Report System (ARS). As described in Section 10 of the 2015 NAAB Procedures for Accreditation "…the program will be assessed a fine of $100.00 per calendar day until the IPR is submitted." If the IPR is not received by January 15 the program will automatically receive Outcome 3 described above. Email questions to forum@naab.org.

---

[1] The team chair will not have participated in a team during the year in which the original decision on a term of accreditation was made.

2. EXECUTIVE SUMMARY OF THE TWO MOST RECENT NAAB VISITS: 2014 and 2008

CONDITIONS NOT MET

2014 VTR	2008 VTR
None	5 Studio Culture (B. Arch & M. Arch)

STUDENT PERFORMANCE CRITERIA NOT MET

2014 VTR	2008 VTR
A.11 Applied Research (M. Arch only)	13.14 Accessibility (B. Arch & M. Arch)
B.4 Site Design (B. Arch & M. Arch)	13.18 Structural Systems (B. Arch & M. Arch)

CAUSES OF CONCERN

2014 VTR	2008 VTR
Building Furnishings & Studio Support	Enrollment Growth
Communications	Limitation of Donor Base
Administrative Structure	Cross Collaboration across Disciplines
Strategic Planning	Diversification
	Research Agenda
	Funding for Nashville Civic Design Center

3. TEMPLATE

Interim Progress Report Year 5
University of Tennessee
College of Architecture and Design
B. Arch [168 undergraduate credit hours]
M. Arch. Track I (undergraduate or advanced degree in another field +106 graduate credit hours)
M. Arch. Track II (preprofessional degree + 60 graduate credit hours)
Year of the previous visit: 2014

Please update contact information as necessary since the last APR was submitted.

Chief administrator for the academic unit in which the program is located:

Name: Scott Poole
Title: Dean
Email Address: scott.poole@utk.edu
Physical Address: 1715 Volunteer Blvd, Knoxville, TN 37996

Any questions pertaining to this submission will be directed to the chief administrator for the academic unit in which the program is located.

Chief academic officer for the Institution:

Name: David Manderscheid, PhD
Title: Provost
Email Address: provost@utk.edu
Physical Address: 527 Andy Holt Tower, Knoxville, TN 37996-0152

I.   **Progress in Addressing Not-Met Conditions and Student Performance Criteria**

    a. Progress in Addressing Not-Met Conditions

       N/A

    b. Progress in Addressing Not-Met Student Performance Criteria

    University of Tennessee, 2019 Response: Satisfied by Two-Year IPR.

II. **Progress in Addressing Causes of Concern**

    University of Tennessee, 2019 Response: Satisfied by Two-Year IPR.

III. **Changes or Planned Changes in the Program**
    Please report such changes as the following: faculty retirement/succession planning; administration changes (dean, department chair, provost); changes in enrollment (increases, decreases, new external pressures); new opportunities for collaboration; changes in financial resources (increases, decreases, external pressures); significant changes in educational approach or philosophy; changes in physical resources (e.g., deferred maintenance, new building planned, cancellation of plans for new building).

University of Tennessee, 2019 Response

Faculty Changes_
Since the Two-Year IPR, the School of Architecture has seen the retirements of Professor John McRae (former Dean of the College and Professor of Architecture) in 2018, and Associate Professor Robert French (Full time faculty member for 44 years) in 2019. Distinguished Lecturer Diane Fox (full time faculty member for 20 years) plans to retire at the end of the Spring 2020 semester. There have also been new faculty hires made since the Two-Year IPR that include Tenure Track Assistant Professor Maged Guerguis, Tenure Track Assistant Professor Marshall Prado, and Full time Lecturer Micah Rutenberg. Rutenberg was hired as part of our Faculty Fellowship program and was subsequently hired to stay on after the one-year fellowship. Their Short Bios are included in the Appendix to this report. The Faculty Fellowship Program, which we call the Tennessee Architecture Fellowship is now in its fourth year and has been a successful program for us, bringing in a faculty member to teach and do a research project on an annual basis.

Administrative Changes_
At the University level, there is a new Provost. David Manderscheid, PhD was hired in July 2018. There is also a new Chancellor of the University of Tennessee, Knoxville. Donde Plowman, PhD was hired in July 2019. Randy Boyd is currently serving as the Interim President of the University of Tennessee. Boyd was appointed in September of 2018 and oversees the statewide system of higher education in the State of Tennessee. This is a significant amount of change in the upper level university administration since the Two-Year IPR was filed in 2016. Through this time, Dean Scott Poole continues to lead the College of Architecture and Design, and Jason Young was appointed to a second term as Director of the School of Architecture in July of 2019. School ByLaws were revised, making provision for an Undergraduate Studies Chair and a Graduate Studies Chair. Associate Professor Brian Ambroziak is currently serving as Undergraduate Studies Chair, and Associate Professor Avigail Sachs is currently serving as Graduate Studies Chair.

Enrollment Changes_
Bachelor of Architecture enrollment has increased from 286 in the Fall of 2017 to 346 in the Fall of 2019. We project the total undergraduate enrollment will continue to increase marginally as smaller upper level cohorts graduate and larger cohorts enter the School of Architecture. Our projections show enrollment will level off around 365 students by the 2021-2022 academic year. Owing to effective recruiting and a concerted strategy to improve the reputation and messaging of our program, undergraduate applications are up 310% (from 173 in 2014 to 537 in 2019) since our last accreditation visit in 2014. Master of Architecture enrollment has increased from 21 in the Fall of 2017 to 35 in the Fall of 2019. Our projected enrollment growth for the graduate program shows enrollment leveling off around 50 students by the 2021-22 academic year. The quality of graduate applications has improved dramatically in recent years, while the quantity of applications has remained steady. We are proud of enrollment position and have a positive outlook for the

future. Available space will ultimately constrain further growth of all programs in our College beyond the enrollment projections reported above.

New Opportunities for Collaboration_
The College of Architecture and Design welcomed a fourth school in the Fall of 2019. With the move of the Graphic Design program from the UT School of Art to The College of Architecture and Design, The School of Design was formally initiated. This school will be the home for the Graphic Design major and the existing Industrial Design minor. There are plans to develop the Industrial Design minor into a degree granting program in the future. This exciting development offers new frontiers for collaboration for the School of Architecture. Collaboration has been a strong differentiator in the College and impacts the quality of our architectural education. With inter-disciplinary studios with Landscape Architecture and Interior Architecture available regularly for our upper level students, and with our first-year students being in an inter-disciplinary curriculum with Interior Architecture students and faculty, collaboration is a shared value in our programs. In addition to this, we have recently reestablished collaborative connections with the Chattanooga Design Studio and have offered two studios in collaboration with their efforts in the city in the past two years. This urban engagement in Tennessee's fourth largest city, establishes collaborative pedagogy between our architecture studios and Nashville (with the Nashville Civic Design Center), Knoxville (with, among other agencies, the East Tennessee Community Design Center), and Chattanooga. Conversations are underway for a studio next year that engages Memphis, which is the second largest city in the State. We are also in the planning stages to take our small, rural community engagement in Appalachia to the next level of development and feel that this will increase both our community engagement opportunities and our collaborations, all while living up to the promise of the land grant university mission of improving the lives of the people in the State of Tennessee.

Changes in Financial Resources_
At this time, the University of Tennessee is in the midst of changing its budget model from a centralized, incremental model that it has implemented annually for the past 225 years to a new performance- and incentive-based model that will give each academic unit more reciprocity with its enrollment, credit hour production, and operational costs. This shift in institutional financing will bring shifts to the College of Architecture and Design, and therefore shifts to the School of Architecture. The new budget model is in development now and we cannot report on what these shifts will be, so we are simply reporting on general anticipated change at this time. We are hopeful that the momentum developed in the School of Architecture will not be adversely impacted by the new budget model at the University of Tennessee.

Significant Changes in Educational Approach_
The School of Architecture is not in a period of significant change in terms of educational philosophy and approach. We are in a period of continuous assessment, feedback, and curricular improvement with a commitment to being a leading teaching and learning center for architecture and design.

Changes in Physical Resources _
There are no new developments with respect to our physical resources. We have continued to improve our Fab Lab resources. At the time of our Two-Year IPR, we reported a $750,000 investment in new, cutting edge fabrication equipment since the Accreditation Visit in the spring of 2014. We now peg the value of that investment at $1.2M and can report that the College of Architecture and Design now owns the 20,000 square foot building, whereas we started the Fab Lab with the long-term lease of the building. Both of these changes document our commitment to the culture of making generally, as well as our specific commitment to giving students exposure to leading edge computational design capacities, robotics, and additive manufacturing.

Curricular Revision_
Since the Two-Year IPR was filed, the faculty in the School of Architecture have committed to significant critique and ongoing improvement of the curriculum in both the Bachelor of Architecture and the Master of Architecture. Working collaboratively and through processes of faculty governance, the curriculum has been changed through a number of thematic working groups defined by the curricular streams of Building Technology/Implementation, Representation/Visualization, and Design Studio.

UNDERGRADUATE

The most significant curricular change is in the area of Building Technology/Implementation. Faculty adoption of the proposed changes to our approach and organization of Building Technology was equivalent to a sea change in the teaching and learning culture of the school. Gone are the siloed courses that pull students away from the project-based learning of design studio and into lecture and test-taking formats. Gone are the types of building science courses that

have historically been taught by engineers that only orbit the design studios. Students in our school take a rigorous sequence of 2 credit-hour, half-semester modules that are team taught by design faculty. These changes took effect in the Fall 2016 semester. Those graduating with a Bachelor of Architecture in 2020 will have a completely different education in building technology than do those students graduating in 2019. The new sequence offers a more integrated curriculum, more project-based learning, and more attempts by faculty to teach the building sciences to design students in ways that meet those students where they are. This is in sharp relief to conceiving of design students as engineers in the context of technology courses only. We couldn't be prouder of the fact that this curricular change was awarded a 2019 National AIA Innovation Award, a testament to our hard work, but also to the potential model our curricular development can offer to the broader national conversation. The AIA Award Submission is included in the Appendix to this report and details all of the courses in the Bachelor of Architecture technology sequence.

Changes to the Representation/Visualization curriculum brought more clarity to that sequence of courses. Changes to the catalog language of the existing courses were brought to the faculty for vote. Once approved, the changes resulted in a move from teaching specific software to teaching workflow, or how to work on various projects by moving between digital and analog platforms and specific tooling.

Parallel to these Curricular changes, First Year Studio teaching was considerably transformed. A single faculty member was assigned to teach ARCH 121 and ARCH 122, which gave all students in the first year the same introduction to drawing and visualization techniques. Meanwhile, the studio approach was shifted away from one coordinator writing the studio projects for all faculty teaching in the first-year studio towards a model where there was more difference and pluralism in the studio teachers. Coordinators author a set of directives and a calendar for the studio, while specific studio teachers write their own briefs, and teach to the directives. This has proven to be a good approach, as the first-year experience has been improving with each subsequent year.

Just recently, the faculty have adopted changes to the catalog language to all the undergraduate studio courses that effectively bring them up to date with incremental changes in studio pedagogy that have been accomplished as the school has developed. This work gave the same critical analysis to the studio pedagogies as we have given the other parts of the undergraduate curriculum. We are fine tuning other recent changes, and the ethos of constant construction of the curriculum is well established in the School of Architecture.

GRADUATE

The primary push in Graduate Curriculum Development has been to minimize the "meets with undergraduate students" character of the School of Architecture approach to graduate students. Obviously, smaller schools have to look for efficiencies in staffing and resource management, and this is why many of the graduate courses were treated as adjuncts to undergraduate versions of courses in the past. This has largely been eliminated, as we have worked towards giving the graduate students a distinct culture and a character of education that ventures away from being similar to the Bachelor of Architecture approach to education. Graduate students need to feel a part of their own culture, have a cohort identity as strong as those developed in the undergraduate culture of the school, and get educational content delivered to them in ways specific to their status as graduate students.

Through curricular development, the graduate technology sequence was completely revamped and students now have three 4 credit-hour intensive, graduate level technology courses on Structures (ARCH 557), Materials and Methods of Construction (ARCH 558), and Building Systems (ARCH 559), respectively. They also have a 3 credit-hour consultancy course that is a co-requisite with the NAAB Integrations Studio (both existed in the curriculum prior). While there will be some overlap with the undergraduate technology content, this change offers a huge improvement, as the graduate students learn these materials differently than the undergraduates. This curricular development further limits the graduate students being in "meet with" courses that are undergraduate courses. Syllabi for ARCH 557, ARCH 558, and ARCH 559 were not included in the Appendix of this report due to page count limitations, but are available upon request.

Additionally, through curricular development and adopted changes to the Graduate Curriculum, we have added a required two course sequence on representation (ARCH 527) and contemporary theory (ARCH 528) to both the 2G and 3G graduate student experience. These new required courses now flow into a third course (ARCH 529), which formerly carried the ARCH 580 number already present in the curriculum, that has been revamped to anticipate the results of these new courses. The overall goal is to provide the graduate students with a required intellectual experience that asks them to reflect on the disciplinary nature of architecture. The representation course is not taught as a "how to draw" course, rather it is offering students exposure to the intellectual aspects of the representation choices they make in

design. The theory course attempts to give students more literacy in how contemporary issues in the field are being tethered to historical and philosophical developments. The thesis development seminar (ARCH 529) then asks students to be more thoughtful about how to structure the mechanics of engagement in the process of design and research. Syllabi for ARCH 527 and ARCH 528 were not included in the Appendix of this report due to page count limitations, but are available upon request.

IV. Summary of Responses to Changes in the 2014 NAAB Conditions

University of Tennessee, 2019 Response:

Much of the Curricular Revision explained in Section III above is evidence of our response to the changes in NAAB Conditions, as the shift from 2009 Conditions for Accreditation to the 2014 Conditions for Accreditation was foundational to our process of curricular critique and improvement. To add to what has already been explained in that section, we would like to speak briefly to the 5 new Perspectives put forth in the 2014 Conditions.

A. Collaboration and Leadership. The program must describe its culture for successful individual and team dynamics, collaborative experiences and opportunities for leadership roles.

As mentioned in Section III above, collaboration is a differentiator for our learning and teaching culture. Key moments of the curriculum foreground team-based projects, some of which are a semester in length, while others are for shorter periods of time. Research is framed and discussed as a collaborative practice and the results of precedent study and analysis are very often collated and shared among students so as to build community around the shared pursuit of knowledge acquisition. Pedagogy that foregrounds the importance of community engagement inculcates in our students the ethical framework of collaboration illustrating that specialization and expertise have value through application and shared results. Coordinated faculty teams in specific studio cohorts, as well as pairs of faculty collaboratively teaching our Building Technology/Implementation courses model the value of teamwork and diversification of voices for our students. Team-based work gives faculty and students the opportunity to access leadership and make that a topic for assessment and communication.

B. Design. The program must describe its approach to developing graduates with an understanding of design as a multidimensional process involving problem resolution and the discovery of new opportunities that will create value.

The value of design is integrated in everything that we do. Hopefully, the integrity of the rest of this Interim Report will make space for what might otherwise seem like hyperbole. It is hard to imagine what more could be said to prove that the School of Architecture is foregrounding the extraordinary cultural potential of design. It defines what we do, who we are, our goals and ambitions for our students. In his book, *Shaping Things*, Bruce Stirling lays out the call for a more responsible and environmentally aware approach to the future. He writes beautifully about a technologically sophisticated culture that must take care that it doesn't look past its most fundamental assumptions of survival and pleasure. Throughout the book, he asserts that there is one group of people with the capacity (he refers to this as "cognitive load") to handle the task of diverting us from a devastating future: Designers.

C. Professional Opportunity. The program must describe its approach for educating students on the breadth of professional opportunities and career paths, including the transition to internship and licensure.

From a first-year field trip to Nashville wherein students visit a number of professional offices, to our course on Professional Practices later in the curriculum, we foreground the practice of architecture in its diverse and numerous forms. Our lecture and exhibition series offers access to many models of professional practice over the course of each school year. Career Day, held annually on the last Friday of February, gives our students the opportunity to interact with professionals who are seeking to hire entry level and summer interns. We hold an impressive number of events for students leading up to Career Day that prepare them for the opportunity to best present themselves. These include portfolio workshops, cover letter and resume writing workshops, and "speed dating" sessions wherein young alumni of our school return to give our current students a fast-paced mock interview event within which to practice their Career Day approaches. Last year we had 65 firms at our Career Day, the majority of which were soliciting both entry level and summer interns. We actively encourage our students to attend Career Day even as underclassmen, noting that they can

establish relationships with professionals through intermittent contact at Career Day, even if they do not feel they can currently compete with graduating students. Faculty support these efforts to make professional practice a significant part of the educational process in our school.

D. Stewardship of the Environment. The program must describe its approach to developing graduates who are prepared to both understand and take responsibility for stewardship of the environment and natural resources.

We note that sustainability initiatives have importantly moved from concentrated, dedicated moments in curricula in many academic departments (not just design schools) to a diffuse condition. The NAAB has noted this as well, moving away from specific SPC (2009 conditions) that look for concentrated environmentalist moments towards listing this as an ambient "Perspective" (2014 conditions). The Building Technology/Implementation sequence rarely strays away from pedagogy that underscores the importance of responsible design thinking that looks for ways to be more careful with natural resources and further safeguard the environment from the adverse effects of development. From teaching passive design strategies to assessing the choices technology offers us in active systems that value responsible understandings of energy usage to being aware of the embodied energy in various material assembly choices we have as architects, environmental stewardship is becoming synonymous with design in our curriculum. Our Integration Studio requires LEED and AIA COTE criteria be tracked and accounted for. Even our commitment to imparting a high level of computational capacity to our students through our Representation/Visualization sequence feeds into a concern for sustainability, as students are able to deploy sophisticated software for energy analysis within the form-finding phases of their design projects to make better environmental choices.

E. Community and Social Responsibility. The program must describe its approach to developing graduates who are prepared to be active, engaged citizens able to understand what it means to be professional members of society and to act ethically on that understanding.

Faculty in the School of Architecture actively seek out opportunities to link their studio projects, and in some cases projects in seminar courses, with opportunities for community engagement. Recent examples include, but are not limited to: students and faculty working with professional designers and board members at Lone Oaks Farm in West Tennessee to help design a master plan for the development of a 4H Youth Camp; students and faculty imagining the potential re-use of a dying mall in downtown Charleston, WV, in a situation where design professionals are hampered by the political controversary surrounding the plight of the mall; students and faculty exploring the mixed-use and adaptive re-use of the Burlington area of East Knoxville, an area that is economically depressed and in need of fresh ideas impacting the physical design of the community; students and faculty designing sustainable and safe multi-family housing in a remote village in post-hurricane Haiti; students and faculty in a seminar course designing, building, and installing handicap ramps for disabled residents in rural Appalachian communities who are otherwise not able to afford such modifications; students researching and designing for the future of Knoxville College, a struggling Historically Black College whose campus has been fenced off from its adjacent community for a number of years; students and faculty designing and building a 1200 square foot Education Building for Beardsley Community Farm, a non-profit community organization that is educating residents in the Mechanicsville neighborhood of Knoxville about the importance of agriculture and food networks. This list includes a number of the more recent efforts. It documents that we actively give our students the opportunity to live community engagement and social responsibility. Thus, these parameters become the foundation of their education in architecture and set the students on a trajectory of ethical engagement.

V. Appendix *(include revised curricula, syllabi, and one-page CVs or bios of new administrators and faculty members; syllabi should reference which NAAB SPC a course addresses. Provide three examples of low-pass student work for SPCs in the following cases--if there are any SPCs that have not been met for two consecutive visits, or If there are three not-met SPCs in the same realm in the last visit--as required in the Instructions.)*

Maged Guerguis_ Short Bio

Maged Guerguis is an Assistant Professor of Design and Structural Technology at the University of Tennessee Knoxville, College of Architecture and Design. Maged earned a Masters degree in Architecture from the University of Illinois at Chicago. He is a designer, researcher, and educator who has received recognition with awards such as the SOM Foundation Research Fellowship and Travel Award, AIA Chicago Divine Detail Award, United States Green Building Council Emerald Award, Architizer A+ Awards, and Fast Company World Changing Ideas Award. Maged is the Director of Soft Boundaries, a multidisciplinary design research lab investigating areas where design concepts overlap with sciences such as Biology, Biochemistry, Robotics, and Differential Geometry. His current research at UTK focuses on the development of high performance integrated construction systems using large-scale additive manufacturing, digital fabrication, novel materials, and advanced computational design methods. In this framework, his research investigates the possibilities of additively-manufactured architecture and the potential impact of this new emerging typology on contemporary design practices.

Marshall Prado_ Short Bio

Marshall Prado is an Assistant Professor of Design and Structural Technology at the University of Tennessee, Knoxville and doctoral candidate at the Institute of Computational Design at the University of Stuttgart. He holds a Bachelor of Architecture from North Carolina State University and advanced degrees as a Master of Architecture and a Master of Design Studies in Technology from the Harvard University Graduate School of Design. Marshall has previously taught at the University of Stuttgart and University of Hawaii and has been an invited studio critic at the University of Pennsylvania, Carnegie Mellon University, the University of Michigan and the Wentworth Institute of Technology. He has led several workshops on computational design and fabrication techniques. His current research interests include the integration of computation and fabrication techniques into lightweight material systems and spatial design strategies.

Micah Rutenberg_ Short Bio

Micah Rutenberg is a Lecturer and Adjunct Assistant Professor of Architecture at the University of Tennessee, Knoxville. He held the 2017-18 Tennessee Architecture Fellowship wherein he conducted research and executed design work on the Great Smoky Mountains National Park and urbanism of Dolly Parton Parkway (US 441). His work is positioned within a larger discourse on East Tennessee that sees the region as an extensive networked ecology of logistical, technological, and natural landscapes. Micah is particularly interested in seeing how digital networks and databases might become new sites of urbanism. As such, while his recent research has focused primarily on Great Smoky Mountains National Park and the urbanism of Dolly Parton Parkway, it is one case study amongst other future case studies examining the various contexts in which digital networks and databases shape new forms of urbanism. Micah has a post-professional design research degree, as well as Master of Architecture from the University of Michigan.

AIA
INNOVATION AWARD

AIA
INNOVATION AWARD

OVERHAUL THE CURRICULUM,
NOT JUST A COURSE

A new paradigm for design technology curriculum

SUMMARY

Background and goals

Like many architecture programs, faculty at X University perceived a disconnect in the students' design work that rarely reflected understanding of concepts from their structures, materials, and other technology courses. Since the 1980's, the school has had a signature "integration studio" pairing a design course with a technology integration course, with faculty teams for every studio. The faculty wondered why this kind of alignment of the design and technology agenda had to wait for the fourth year.

The X faculty has taken a radical approach to integrating design and technology in a major curriculum overhaul of its B. Arch. Program.

The faculty had the following goals in mind:

- Expose students to technology challenges and issues early in the curriculum, within a design framework.
- Interrelate technology course content and design studio goals where possible.
- Invent new pedagogical formats and teaching platforms.
- Eliminate stand-alone silos of technological content for single courses, taught by content "experts."
- Respect faculty perspectives and the diversity of experimentation in the design studios.
- Leverage and expand the digital agenda of the school.

Summary

The faculty eliminated all of the stand-alone structures, technology, and materials courses. Our experience may be of interest to other programs that face similar challenges.

The key framework for the revised curriculum is the series of nine half semester courses of two-credit hours each, aligned with the second and third year studio agendas. Each of these half semester courses included "blended" content related to climate, site, enclosure, materials, structures, building systems, design, and performance.

"Blended content" and reiteration of principles and concepts

throughout the series was considered desirable. Because of the concern for potential missing content or duplication, the logical presentation of content throughout the series was defined in a series of bullet points related to each of the nine courses. Extensive cross-checking of course content was necessary to convince faculty that critical content would be part of the new sequence. The faculty also cross-referenced NAAB criteria.

As curriculum discussions progressed, it became increasingly clear that the school's digital agenda was another opportunity to explore the merging of design and technology. Data manipulation, modeling, visualization, and fabrication extrapolate design strategies, while blurring the distinction between design and technology categorization.

While we have a logical numbering system for these courses, a shorthand system and course title is below. Each course is a half semester, for two-credit hours, with a co-requisite design studio.

T1   Tectonics and Stereotomics
T2   Climactic and Daylight Design
T3   Design Implementation I: Principles
T4   Design Implementation II: Assemblies
T5   Design Research in Technology
T6   Schematic Design Technology
T7   Design Implementation III: Systems
T8   Performative Design I: Passive Systems
T9   Performative Design II: Active Systems

The content topics for each studio and technology course are shown in the following pages, along with examples of student design work.

Faculty have great leeway in interpreting these goals and in determining a course schedule, overall content and assignments that address the basic course content. In particular, the studio agendas vary significantly depending on instructor.

PROCESS

Process
The ambitious curriculum change involved hundreds of hours of preparation, along with three years of faculty meetings, committee meetings, and workshops. Flexibility and compromise were ultimately demonstrated by virtually everyone, bringing the faculty to a consensus on a significant change. These long and necessary discussions ultimately laid the groundwork for successful implementation of a shared vision.

Time line
The faculty discussed and planned the new curriculum for almost two years before the final voting in 2015.

Starting with the second-year class in the Fall of 2016, we have now cycled through the series of the nine courses in the second and third year of our B.Arch. curriculum. The traditional fourth year integration studio (and course) continues, in a stronger way.

At the conclusion of Spring 2018, we had a faculty symposium, reviewing all the courses and outcomes of this new series. We continued to revise aspects of the new courses.

The teaching teams for the series
The half semester format provided more flexibility in teaching assignments and for inviting other appropriate instructors or course visitors. To reinforce the collaborative spirit of the series, different teaching teams of two faculty were assigned to each of the two credit hour courses.

Some "content experts" might visit the course for a short "workshop" in a specific topic. The approximate class size varies from 60 – 70, although these students are in 4 -5 different design studio sections, each with different design faculty members and studio challenges.

 Qualified fourth and fifth-year teaching assistants were part of the technology teaching team, so that each studio section had a single faculty member or teaching assistant consultant for project assignments.

General approach to the overlap of the technology series and design studios
Each semester, group meetings insure that the design studio and technology series faculty are generally aware of the content, schedule, assignments, and deadlines that students will encounter in their required courses during the semester. Faculty can design their courses and assignments accordingly.

Design faculty are not required to have a significant technology mandate as part of the studio agenda, although most were agreeable in overlapping goals and assignments in some way.

The school has a long tradition in valuing architectural history and theory, with many design courses including precedent analysis. Often, but not always, this was a good opportunity for overlapping assignments in the T series and in the design studio.

In some cases, a faculty member teaching one of the technology courses was also assigned to a concurrent design studio. In this case, course goals could more seamlessly interrelate.

In other cases, a design faculty member had a design studio agenda which was not directly related to tectonic issues. In this case, technology assignments could be modified for those studio sections. For example, a studio precedent analysis might focus on a painting analysis or an analysis of film. In the technology course involving a precedent-based assignment, the technology faculty would suggest a few appropriate buildings.

COMPARISON: FORMER AND REVISED CURRICULUM

Structures ECS Materials Sustainability/ Integration

Former Curriculum: The technology courses are clustered in the third year. Six courses were eliminated: structures, ECS, materials, and introduction to technology, 22 credit hours.

The 4th Year "Integration" course and studio remained unchanged, serving as F or the curriculum overhaul in integrating technology in studio starting in the second year.

Revised curriculum, 2016: A series of nine half semester two-credit-hour technology courses aligns with second and third-year studios. Each of the new courses has a blend of content related to concepts and principles in materials, site, climate, structures, environmental control systems, design, and building performance.

A reduction in total degree credit hours resulted.

16

COURSES IN THE NEW CURRICULUM:
CONTENT AND STUDENT WORK

YEAR	STUDIO	TECHNOLOGY COURSES	
2ND YR FALL	**STUDIO:** PLACE / URBAN CONTEXTS	**T1** TECTONICS AND STEREOTOMICS	**T2** CLIMACTIC AND DAYLIGHT DESIGN
2ND YR SPRING	**STUDIO:** PLACE / CAMPUS CONTEXT	**T3** DESIGN IMPLEMENTATION I: PRINCIPLES	**T4** DESIGN IMPLEMENTATION II: ASSEMBLIES
3RD YR FALL	**STUDIO:** RESEARCH AND DESIGN	**T5** DESIGN RESEARCH IN TECHNOLOGY	**T6** SCHEMATIC DESIGN TECHNOLOGY
3RD YR SPRING	**STUDIO:** SUSTAINABILITY	**T7** DESIGN IMPLEMENTATION III: SYSTEMS	**T8/T9** PERFORMATIVE DESIGN: PASSIVE/ACTIVE SYSTEMS
4TH YR	**STUDIO** INTEGRATION DESIGN STUDIO	**T10** INTEGRATION OF BUILDING SYSTEMS IN DESIGN	

2ND YR FALL

MAPPING OF COURSE GOALS AND CONTENT

STUDIO:
PLACE / URBAN CONTEXTS

Arc 271   6 ch   Architectural Design I: Place

Contextual determinants in architectural design. Role of the city in architectural design. Methods of analyzing place and form in determining design strategies. Introduction to spatial implications of structure and sustainable urbanism. Representational skills developed including drawing, diagramming, and modeling techniques.

Course format
Fall semester of the second year design course, meeting three times per week in a studio/lab setting.

Topics introduced in this course are:
• Issues relating to urban analysis: public spaces, sequence, typologies, scale,
• Environmental factors, and the structure of the city
• Appropriate programs for urban conditions
• Design principles related to sustainability in urbanism
• The importance of the building section in understanding architectural ideas
• An understanding of natural and formal ordering systems
• Spatial implications of bearing wall systems and column grid systems
• Reinforcement of design fundamentals from the first year
Requirements are determined by the faculty for each assignment in an appropriate way.

2009 NAAB criteria   A. 6 Fundamental Design Skills / A.8 Ordering Systems Skills / B.4 Site Design

T1
TECTONICS AND STEREOTOMICS

Arc 261   2 ch   Tectonics and Stereotomics

Design and expression with structural archetypes. Exploration of distinctions between structure and enclosure. Emphasis on formal ordering systems, spatial implications, and structural concepts. Topics include gravity loads, earth-shaping, massive construction and light frames. Combination lecture and lab format. First half semester course.

Topics
 Material properties
• Fundamental properties and poetics of stereotomy
• Fundamental properties and poetics of tectonics
• Aesthetics and consequences of expression
• Thermal transfer and thermal mass
Structural Logic
• Basic load bearing structural elements and assemblies
• Relationship between structure and enclosure
• Spatial consequences of structure and enclosure
Ground reference and manipulation
• Soil properties
• Shaping the ground, issues of drainage
• Contour representation and modification

Project Examples
Terrain models, framing model, thick and thin walls, fabrication exercise.

Studio Relation
Foundation for second half of studio designs. Studio precedent study can include column / wall structural systems.

2014 NAAB criteria. A.6 Use of Precedents   / B.4 Technical Documentation / B.5 Structural Systems / B.6 Environmental Systems / B.7 Building Envelope Systems and Assemblies / B.8 Building Materials and Assemblies

T2
CLIMACTIC AND DAYLIGHT DESIGN

Arc 262   2 ch   Climactic and Daylight Design

Introduction to design and expression with climate as a context and form-generator. Emphasis on design guidelines and formal ordering. Analysis of climates, selection of site and building design strategies, design for microclimates and enhancing daylighting. Combination lecture and lab format. Second half semester course.

Topics
Bio-climatics
• Comfort and perceptual experience
• Climate analysis (global, regional, local)
• Site analysis relating to climate
• Daylighting analysis
• Wind analysis
Preliminary design strategies
• Preliminary building and site design strategies relating to climate
• Outdoor room design
• Thermal enclosure basics
• Cross-ventilation design strategies
• Daylighting design strategies
• Introductory software analysis

Project Examples
Climate analysis, site analysis, zoning strategies, outdoor rooms,

Studio Relation Linked. Course uses studio projects as vehicle for assignments. Supports studio intentions with design methods. Studio projects require relatively simple program with an enclosure. Foundation for spring studio site analysis.

2014 NAAB criteria A.3 Investigative Skills / B.2 Site Design / B.6 Environmental Systems / B.7 Building Envelope Systems and Assemblies

T 1
2ND YEAR FALL

TECTONICS AND STEREOTOMICS

Lintel
Column*
Beam
Column*
Beam
Floor plate
Girder*
Column*
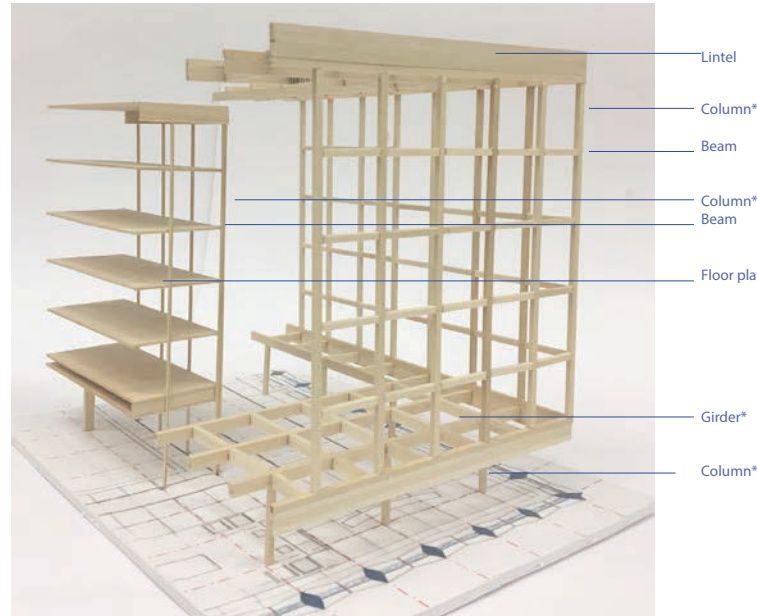
Structural maquette | perspective

The exterior structure is supported by a series of columns that in turn support the floor girders. These support the vertical columns that help make up the primary structural system.
The interior bookshelf stacks are composed on verticle columns that support horizontal beams. These beams support the floor plates on which the bookshelves rest.

Due to the heavy emphasis on the grid in this structure, it was difficult to identify an anomaly. However, there is a break in the grid surrounding the bookshelf stack and around the stair case. In addition, the roof grid does not start until one block space into the grid. This draws attention to both the procession around the bookshelves and the ceiling condition.

The most helpful documents were construction images. These allowed me to see the structural qualities of the building before the facade was added.

Showcase your structural maquette with a series of photographs from various angles. You may add up to one additional page to compose your images.

For extra bonus (up to 10 points) develop one, two, or three images into analytical diagrams. Diagrams may highlight rhythm and bay spacing, conditions of anomaly (described in your narrative), load distribution, etc. Be sure to decrease the opacity of the image to 50-65% so linework and annotation are legible. A title and short caption should accommodate each diagram.
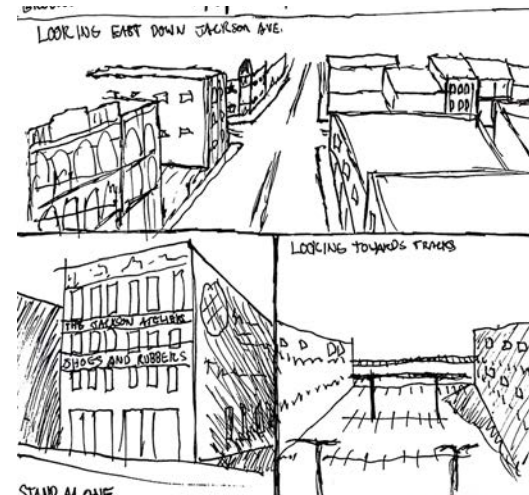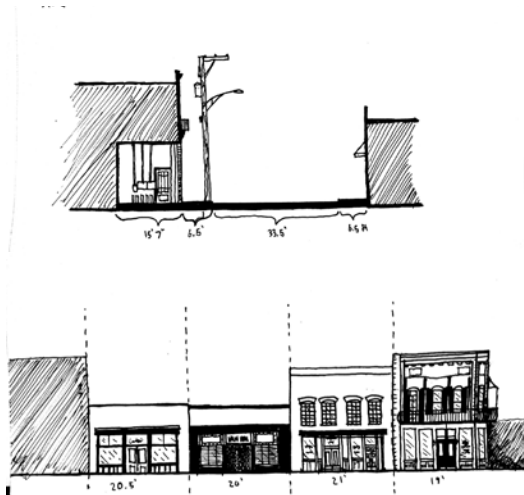
T 2
2ND YEAR FALL

CLIMACTIC DESIGN AND DAYLIGHTING

December 21, 3 p.m.

December 21, 12 p.m.

December 21, 9 a.m.

June 21, 3 p.m.
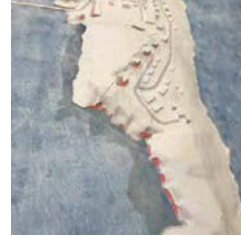
June 21, 12 p.m.

June 21, 9 a.m.
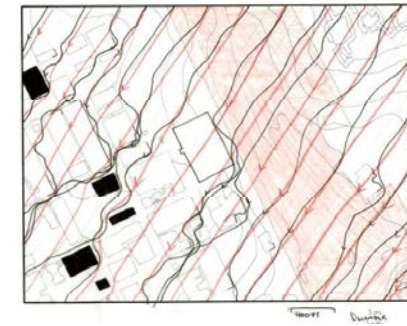
Pattern of winter winds
(primary direction, December)
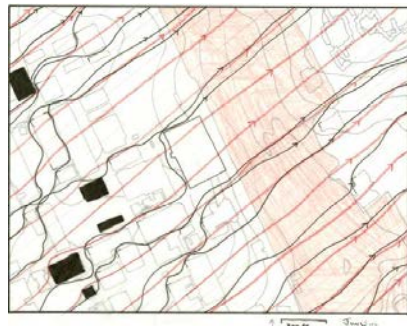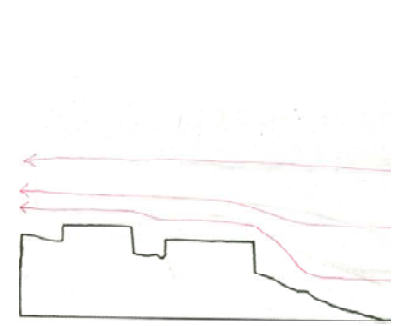
Pattern of summer winds
(primary direction, June)
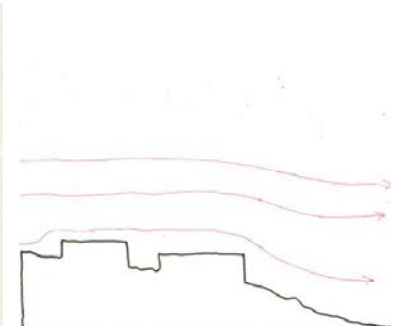
The reflection off the water is very strong during the afternoon hours. In the morning it is lit but not glaring and in the evenings there is plenty of shade on our site from the bridge. In the winter the glare is also worse because the sun has a lower angle. In this picture you can observe a Fall time and afternoon sun reflection, with the sun in the west.
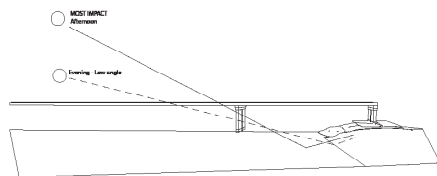
Image 3.1 Overcast

Image 3.2 Sunny

Temperature: The images above show the movement of the sun while at the site. The sun would often hide itself behind small clouds and then reappear a few minutes later. This would cause the temperature to change which affected the thermal environment and experience.
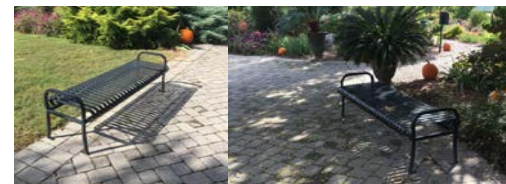
Image 3.3 Bench in sunlight

Image 3.4 Bench in shade

Comfort and Pleasure: The image on the left shows the bench that was always in

Investigations of expression: final maquette

20

2ND YR SPRING

MAPPING OF COURSE GOALS AND CONTENT

STUDIO:
PLACE / CAMPUS CONTEXT

Arc 272 6 ch Architectural Design: Place

Contextual determinants in architectural design. Role of the landscape in architectural design. Methods of analyzing place and precedents in determining design strategies. The role of function, habitation, movement, structure and scale. Development of design processes, including analytical skills, diagramming, and organizational strategies. Use of computer aided visualization techniques

Course format
Spring semester of the second year design course, meeting three times per week in a studio/lab setting.

Topics
• Exposure to precedents and typologies of program and parti
• An understanding of the campus as context, and appropriate programs
• Issues relating to landscape analysis: slope and contours, views, use, scale, orientation, environmental factors, and the structure of the land
• An understanding of natural and formal ordering systems
• Architectural implications of materials
• Reinforcement of material introduced in other courses
• Continued conceptual understanding of architectural design, particularly in relationship to architectural precedents from the last century
• Continued development of visualization and communication skills
Each faculty member interprets course goals with design challenges and project assignments..

2009 NAAB criteria   A. 6 Fundamental Design Skills / A.8 Ordering Systems Skills

T3
DESIGN IMPLEMENTATION I: PRINCIPLES

Arc 263 2 ch Design Implementation I: Principles

Design and expression with structural archetypes, energy considerations, and material properties (of timber and simple steel frames with point loads.) Related to walls, floors, point loads, and enclosures. Emphasis on formal ordering systems and essential behaviors, including lateral bracing and load-tracing. Associated interior and exterior wood construction materials, methods, performance and detailing. Enclosure strategies including performance (thermal and moisture) and expression. Schematic detailing. Design guideline sizing. Combination lecture and lab format. First half semester course.

Topics
Typologies: use, technologies, cultural context
Relevant LEED and environmental criteria.
Introduction to properties of materials.
• Stereotomic principles of walls
• Tectonic principles of beams, columns, floors.
• Masonry enclosures, walls and systems
Introduction to R values and thermal performance
Basics of wall sections and expression.
• Enclosure strategies of frames: thermal & moisture performance.
Principles of Structure
• Structural types and spatial order.
• Force distribution and calculation.
• Load determination.
• Shear, bending, deflection.

Project Examples: framing model. Element sizing and selection. Fabrication exercise. Wall section case study

2014 NAAB criteria: A.6 Use of Precedents / B.4 Technical Documentation / B.5 Structural Systems / B.6 Environmental Systems / B.7 Building Envelope Systems and Assemblies / B.8 Building Materials and Assemblies
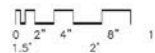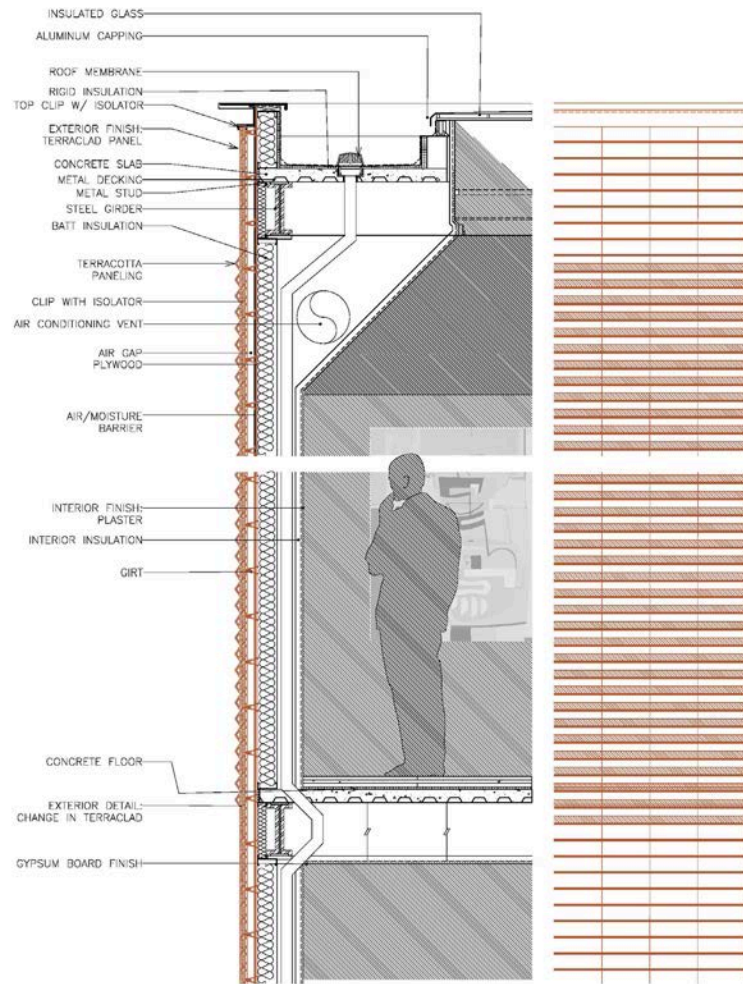
T4
DESIGN IMPLEMENTATION II: ASSEMBLIES

Arc 264 2 ch   Design Implementation II: Assemblies

Design and expression with structural archetypes, energy considerations, and material properties of walls, and frames, trusses, and more complex organizations and assemblies. Emphasis on formal ordering systems and essential behaviors, including structural and thermal mass. Associated interior and exterior light steel, brick, stone and concrete masonry materials, methods, performance and detailing. Design guideline sizing. Combination lecture and lab format. Second half semester course.

Topics
Typologies: use, technologies, cultural context
Relevant LEED and environmental criteria.
Properties of materials
• Tectonic materials and assemblies related to wood and steel.
• Stereotomic materials and assemblies related to masonry and concrete.
Basics of wall sections, assemblies, and expression.
• Non-residential enclosure strategies, thermal & moisture performance
• Thermal mass performance
Principles of Structure
• Trusses design, moment.
• Wind loads. Integration with mechanical distribution
• Steel braced and moment frames.
• Related foundations and construction techniques
• Structural organizational types, spatial order.

Project Examples   Framing model and diagramming. Element sizing and selection. Truss design. Case Study and/or mock-ups. Wall section design drawing.

2014 NAAB criteria. B.4 Technical Documentation / B.5 Structural Systems / B.6 Environmental Systems / B.7 Building Envelope Systems and Assemblies / B.8 Building Materials and Assemblies

T 3

2ND YEAR SPRING

DESIGN IMPLEMENTATION I

PRINCIPLES

Daily assignments related to class presentations: material case studies, structural forces, load calculations, moment and shear diagrams and calculation of R values in a wall assembly.
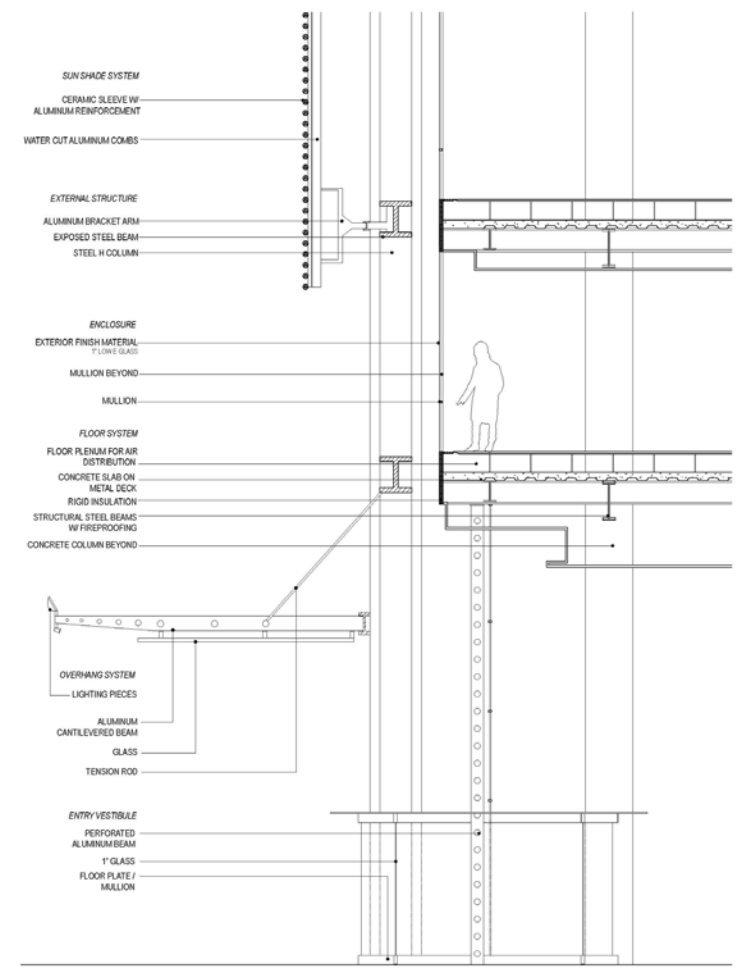
For the last three weeks of the course, teams, with two students each, researched a case study precedent, producing a wall section and axonometric view.
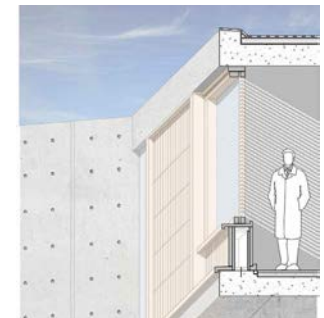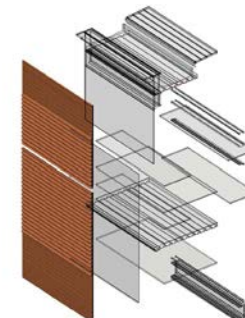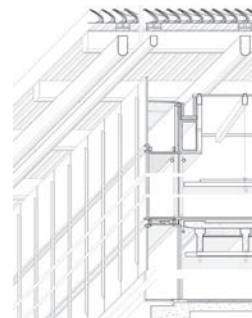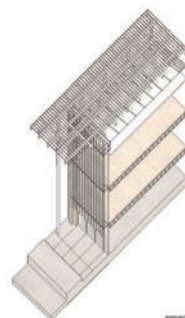

INSULATED GLASS
ALUMINUM CAPPING
ROOF MEMBRANE
RIGID INSULATION
TOP CLIP W/ ISOLATOR
EXTERIOR FINISH: TERRACLAD PANEL
CONCRETE SLAB
METAL DECKING
METAL STUD
STEEL GIRDER
BATT INSULATION

TERRACOTTA PANELING
CLIP WITH ISOLATOR
AIR CONDITIONING VENT
AIR GAP
PLYWOOD
AIR/MOISTURE BARRIER

INTERIOR FINISH: PLASTER
INTERIOR INSULATION
GIRT

CONCRETE FLOOR
EXTERIOR DETAIL: CHANGE IN TERRACLAD
GYPSUM BOARD FINISH

0 2" 4" 8" 1'
1.5' 2'

BUILDING SECTION   PARTIAL ELEVATION

BECHTLER MUSEUM, CHARLOTTE NC, 2009
MARIO BOTTA

SUN SHADE SYSTEM
CERAMIC SLEEVE W/ ALUMINUM REINFORCEMENT
WATER CUT ALUMINUM COMBS

EXTERNAL STRUCTURE
ALUMINUM BRACKET ARM
EXPOSED STEEL BEAM
STEEL H COLUMN

ENCLOSURE
EXTERIOR FINISH MATERIAL
1" LOW-E GLASS
MULLION BEYOND
MULLION

FLOOR SYSTEM
FLOOR PLENUM FOR AIR DISTRIBUTION
CONCRETE SLAB ON METAL DECK
RIGID INSULATION
STRUCTURAL STEEL BEAMS W/ FIREPROOFING
CONCRETE COLUMN BEYOND

OVERHANG SYSTEM
LIGHTING PIECES
ALUMINUM CANTILEVERED BEAM
GLASS
TENSION ROD

ENTRY VESTIBULE
PERFORATED ALUMINUM BEAM
1" GLASS
FLOOR PLATE / MULLION

0 1' 2' 3' 4.5' 6'

WALL SECTION

NEW YORK TIMES BUILDING, NEW YORK, USA, 2001-2007
RENZO PIANO/ FXFOWLE ARCHITECTS

T 4

2ND YEAR SPRING

DESIGN IMPLEMENTATION II

ASSEMBLIES

Class presentations and workshops challenged students with short assignments. The Second Year design faculty agreed to require a wall section and structural framing plan, as part of the final design presentation, building on the student expertise in developing a wall section for well known precedents.

From left to right, on the lower row: hands-on structures workshop with biomorphic form, structures workshop with analysis of moment and shear, parametric analysis, and drawings from final reviews.
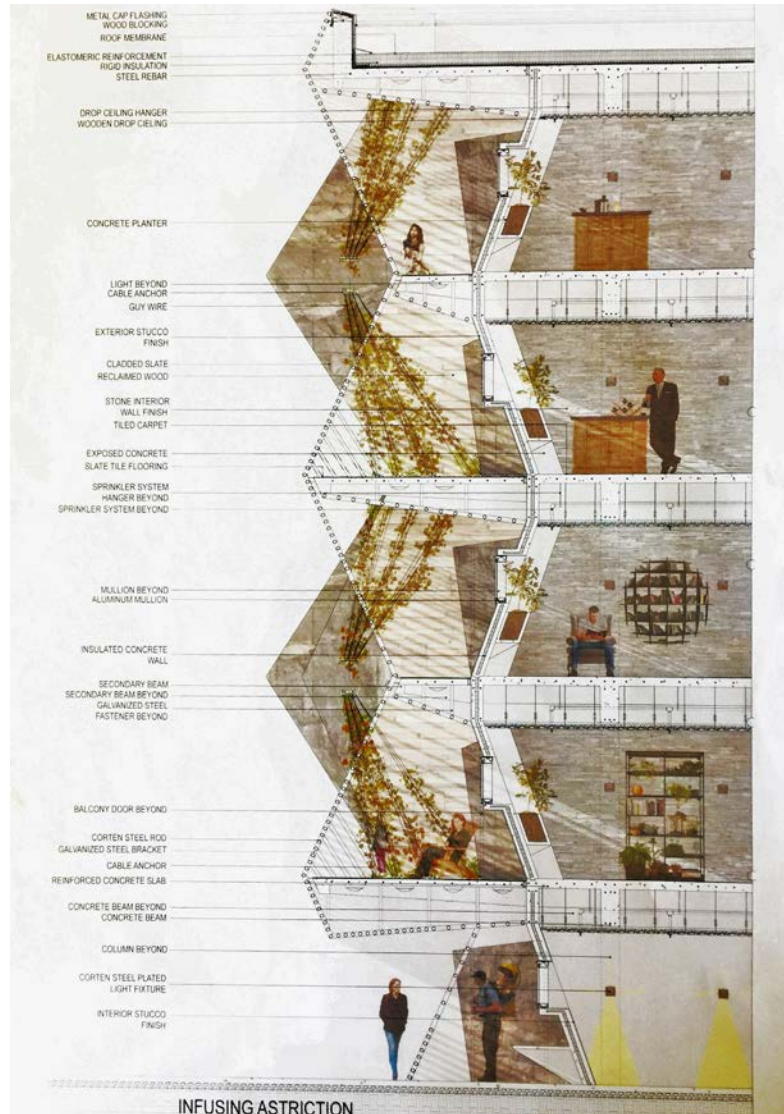
Student Work: Detailed wall sections of studio projects.
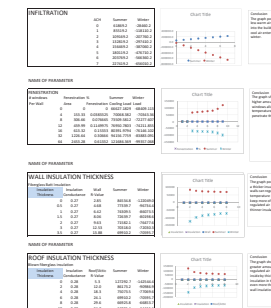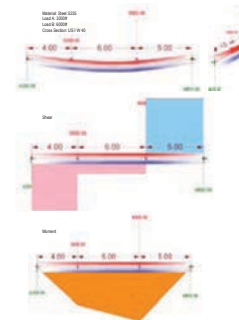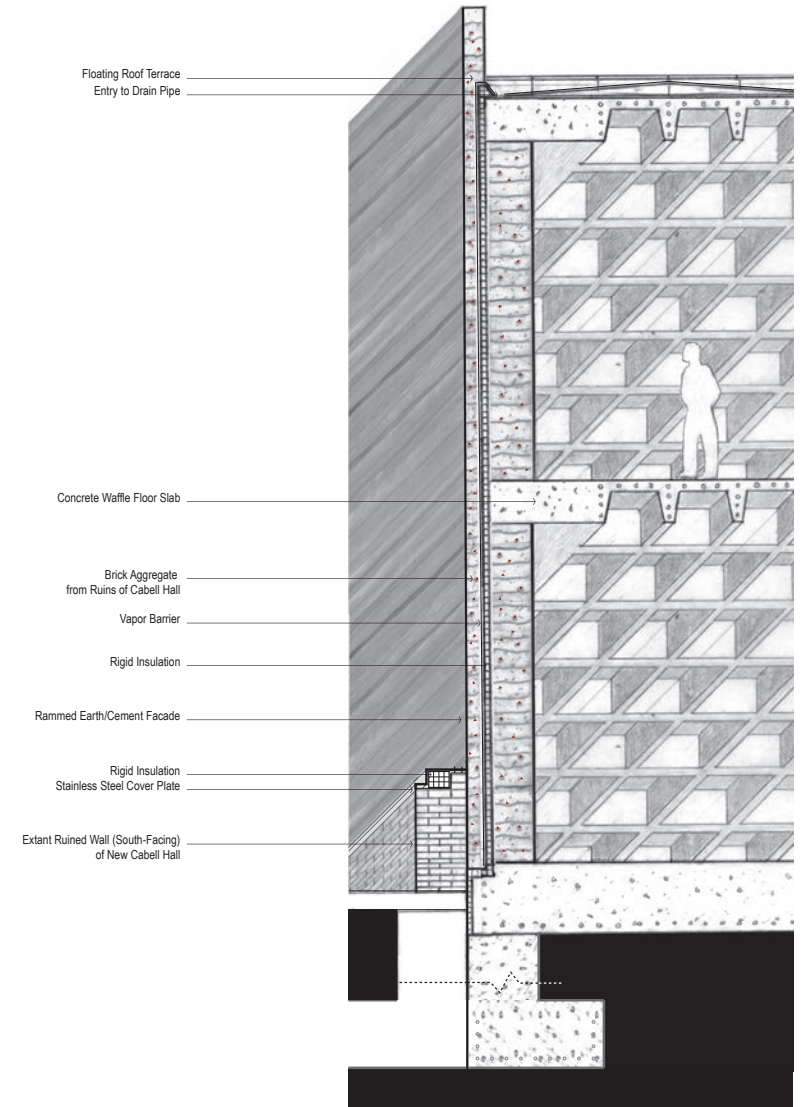
3RD YR FALL

MAPPING OF COURSE GOALS AND CONTENT

STUDIO: RESEARCH AND DESIGN

Arc 370   3 ch   Research and Design

Research as an intrinsic aspect of the design process. Use of investigative skills in documentation, research, and analysis of program, site, relevant laws, precedents, and user requirements. Formation of comprehensive program. Combination lecture, seminar, and studio format. First half semester course.

Arc 371   3 ch, req. Design as Applied Research

Understand the design process in relation to research. Execution of design project (as defined in Architecture 370), exploring the implications of research on schematic design. Completed projects apply research from Architecture 370 through assessment of alternative approaches and well-reasoned design decisions. Design studio format. Second half semester.

Course Format
The Arc370 course takes place in the first half of the semester followed by Arc 371, a studio format course, Thus, students are able to immediately apply an understanding of pre-design research and programming to the design of a related project. The faculty initiates an overall design topic. Students typically have the same faculty member for Arc 370 and 371.

Content
In Arc 370, students gain a general understanding of programming theory and techniques of research and analysis related to site, program, and precedents.

In Arc 371, students generate the schematic design and development of a selected project.

2009. NAAB criteria: A.1 Communication Skills / A. 5 Investigative Skills / A. 7 Use of Precedents   / A.11 Applied Research / B.1 Pre-Design / B.2 Accessibility / B.5 Life Safety / C. 3 Client Role in Architecture /   C. 9 Community & Social Responsibility

T5 DESIGN RESEARCH IN TECHNOLOGY

Arc 361 2 ch   Design Research in Technology

Input to the architectural design research from a range of technical issues. May include building codes, construction types, cost, fire resistance, area and bulk, along with comfort parameters, lighting intentions, energy performance targets, energy programming and schedules, etc. Focus on framing the designer's tasks and the technical support of architectural qualities. Supports technical aspects of program development in 370. Combination lecture and lab format. First half semester course.

Topics
Relevant LEED and environmental criteria
Regulations
• Building codes and occupancy
• Egress, fire protection and materials
Structural Systems
• Earthquake and wind zones
• Building codes and allowable construction types, size limitations
Energy Considerations
• Energy, lighting and HVAC zoning
• Energy, carbon and comfort performance targets
• Balance point and design strategies. Shading periods
Acoustics
• Principles
• Absorption, reflection, materiality

Project Examples
Performative agendas. Pre-design code analysis. Energy programming. Qualitative visions for light, thermal experience, spatial intent. Zonal criteria. Balance point temperature and design strategies.

2014. NAAB criteria: B.1 Pre-Design / B.2 Site Design / B.3. Codes and Regulations / C.1 Research / C.2 Integrated Evaluations and Decision-Making Design Process

T6 SCHEMATIC DESIGN TECHNOLOGY

Arc 362 2 ch   Schematic Design Technology

Design concepts, form-making and supporting strategies from a range of technical issues in support of studio class projects. Exploration of the implications of technical aspects of program on schematic design. Focus on early design methods to engage design implications of technical knowledge. Combination lecture and lab format. Second half semester course.

Resources   Combined Reader: Thermal Delight in Architecture; Architecture of the Well Tempered Environment; In Praise of Shadows; Architecture of Dissipation, etc..

Topics
• Selection of construction systems
• Applied code analysis
• Fire protection and building materials
• Introduction to acoustics and interior finishes
• Thermal, daylight, HVAC and acoustic zoning/ strategies & pathways
• Organizational logics; structure + enclosure concept development
• Energy concept development and applied design guidelines
• Basics of wall sections and expression
• Relevant LEED and environmental criteria

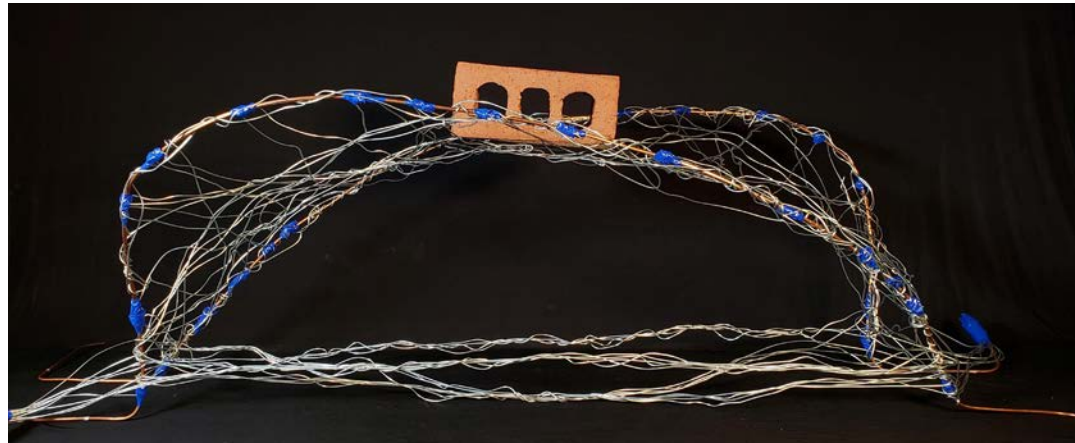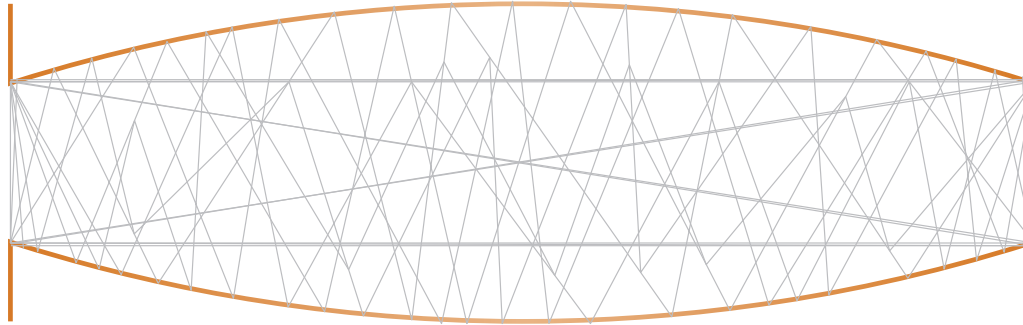Project Examples   Performative agendas. Active/ passive systems. Structural design.

2014 NAAB criteria: B.2 Site Design / B.3. Codes and Regulations / B.5 Structural Systems / B. 8 Environmental Systems
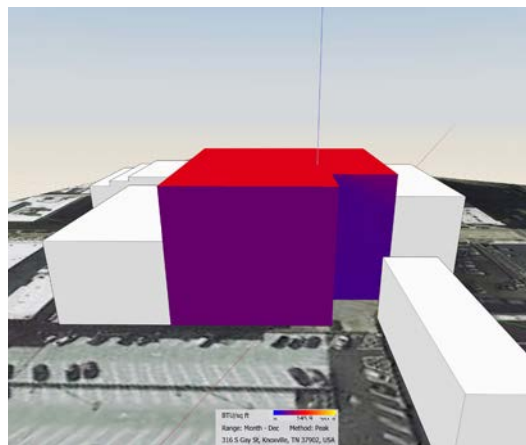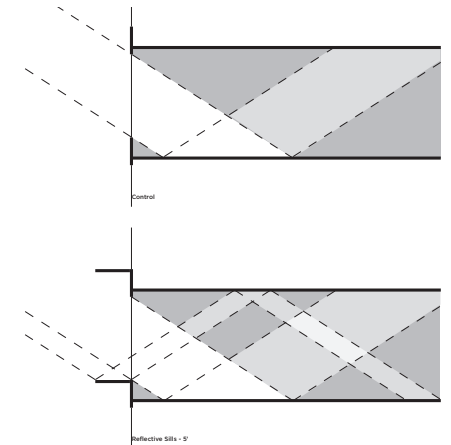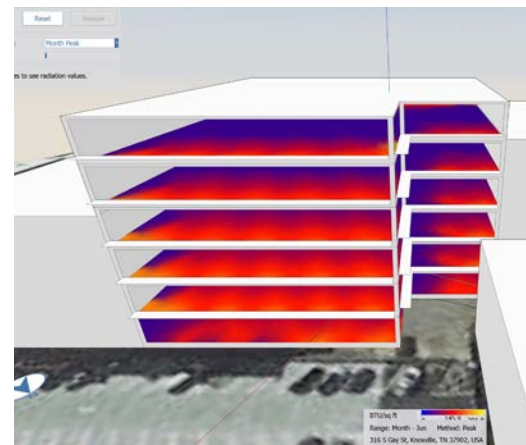
T 5

3RD YEAR FALL

DESIGN
RESEARCH
IN
TECHNOLOGY

Student Work: Create a structure strong enough to support a brick.

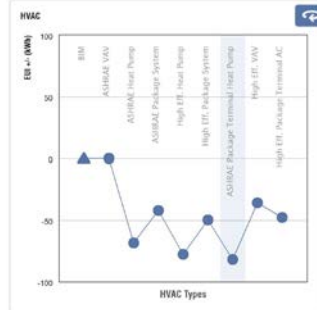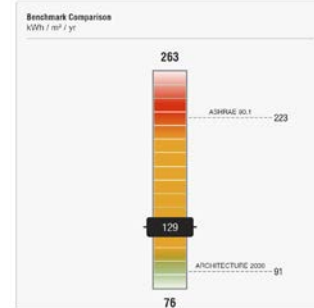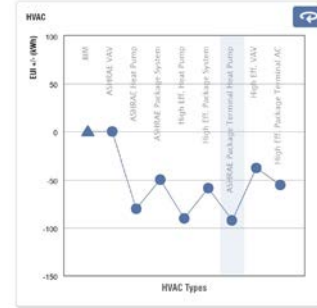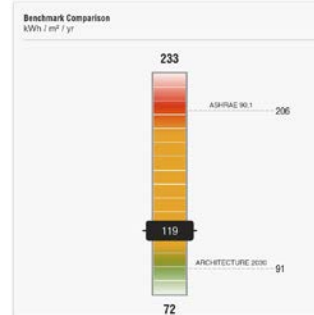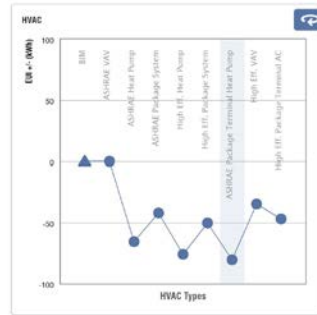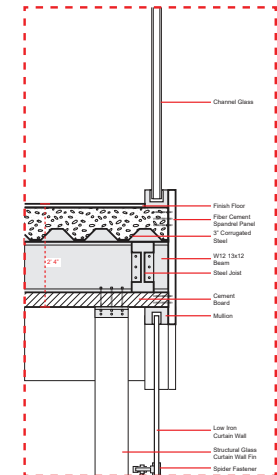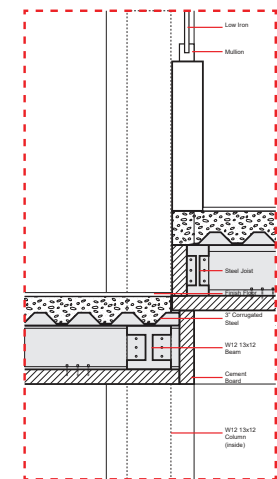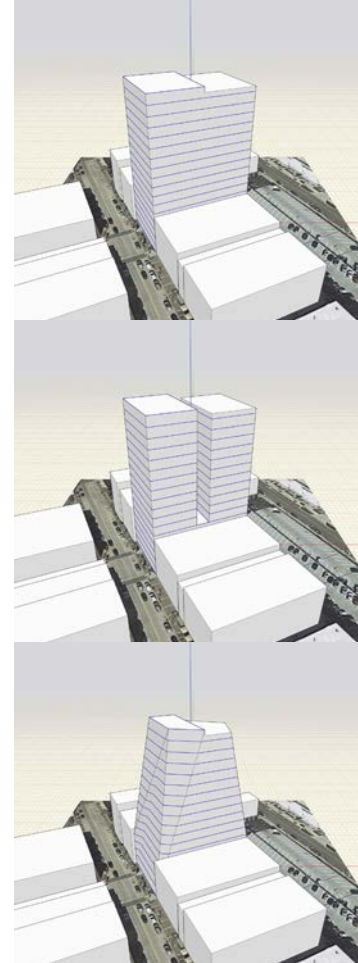Student Work: Various solar heat gain / light infiltration studies.
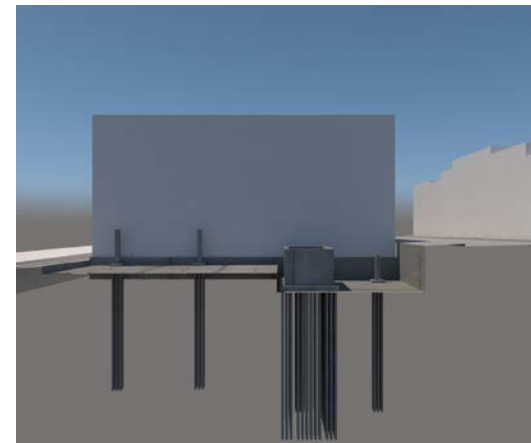
T 6
3RD YEAR FALL
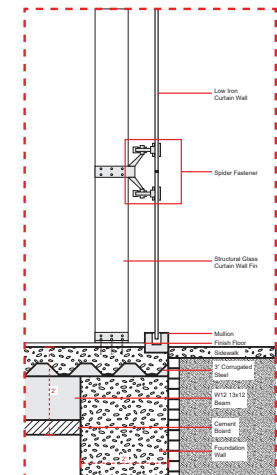
SCHEMATIC DESIGN TECHNOLOGY
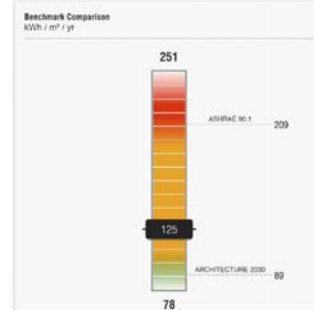
Student Work: Autodesk FormIt calculations for various building forms.

Student Work: Foundation construction rendering.

Student Work: Foundation construction rendering.

Student Work: Detail drawings of a larger wall section.

3RD YR SPRING

MAPPING OF COURSE GOALS AND CONTENT

The Third Year Spring studio has a wide range of faculty teaching, with broad interpretations of the catalog description;

Arc 372   6 ch, req. Architectural Design IV Design synthesis. Integration of design determinants emphasizing structure, sustainability, materials and construction

T7
DESIGN IMPLEMENTATION III: SYSTEMS

Arc 363 2 ch   Design Implementation III: Systems

Design and expression with structural archetypes, energy considerations, and material properties integrated into building systems of reinforced concrete, including combinations with masonry and steel. Emphasis on formal ordering systems and essential behaviors, including structure to skin relationships. Associated interior and exterior enclosure materials, methods, performance, and high-performance skins. Design guideline sizing and detailed calculations. Combination lecture and lab format. First half semester course.

Topics
*   Typologies - use, habitation, historical/economic/resource related contexts
*   Properties of concrete; properties of materials used in hybrid construction
*   Structural organizational patterns and types, spatial order
*   Stereotomics and tectonics of concrete different materials
*   Concrete frames, beam, column and slab design
*   Steel frames, beam, column and slab design
*   Related foundations, construction techniques
*   Long-span options, earthquake loads
*   Acoustics
*   High-performance envelope concepts
*   Interrelationships of building systems related to structure, enclosure, materials, and energy performance
*   Relevant LEED and environmental criteria

Project Examples
Framing model, digital analysis, diagrams, sizing. Wall section case study. Wall section design drawing.

2014 NAAB criteria: B.5 Structural Systems: B.9 Building Service Systems. B.7 Building Envelope Systems and Assemblies: B.8 Building Materials and Assemblies

T8
PERFORMATIVE DESIGN PASSIVE SYSTEMS

Arc 364   2 ch   Performative Design I: Passive Systems

Design and expression for passive solar heating, natural ventilation, and passive cooling, including collection, storage, distribution, and shading. Introduction to passive systems computer modeling. Supports applications in design studio of projects with simple HVAC in skin-loaded buildings with few thermal zones. Combination lecture and lab format. First half semester course.

Topics
*   Thermal envelope performance
*   Heat, moisture, & vapor flow
*   Design and analysis for daylighting, passive cooling and heating
*   Radiant rooms and thermal mass, material performance. Multivalent elements
*   Fixed and dynamic shading design, annual energy use
*   Acoustics
*   Energy modeling workshops. Hydrothermal principles and tools
*   Relevant LEED and environmental criteria

Project Examples:
Massing and zoning. Pathways organization. Apertures. Energy modeling of passive heating, cooling, ventilation and lighting.

2014 NAAB criteria: B.2 Site Design / B.6 Environmental Systems   / B.7 Building Envelope Systems and Assemblies / B.8 Building Materials and Assemblies

T9
PERFORMATIVE DESIGN ACTIVE SYSTEMS

Arc 365   2 ch   Performative Design II: : Active and Hybrid Systems Design

Design and expression with mechanical heating, ventilation and cooling systems, electric lighting and their integration with passive design. Introduction to active systems computer modeling, carbon performance, and on-site renewable power generation. Supports applications in design studio of projects with simple HVAC in skin-loaded buildings with few thermal zones. Combination lecture and lab format. Second half semester course.
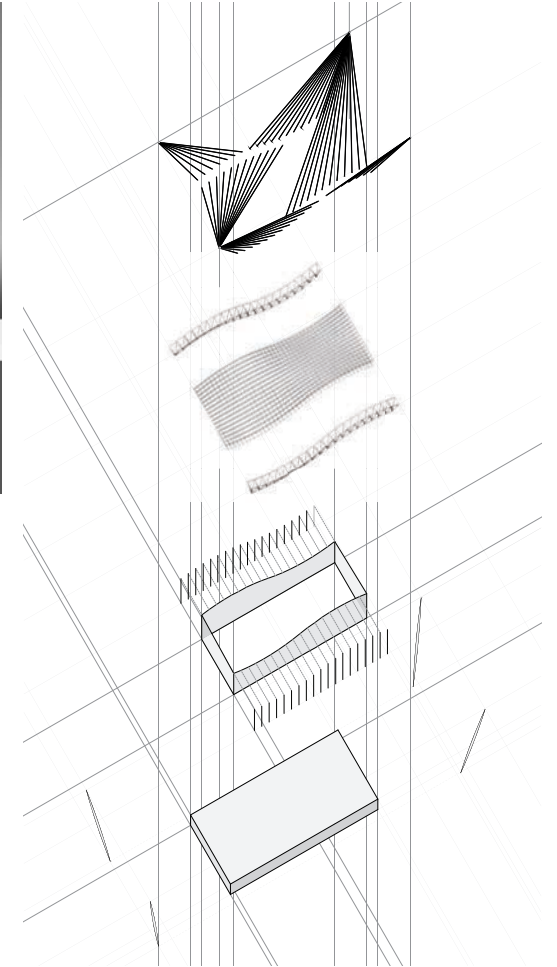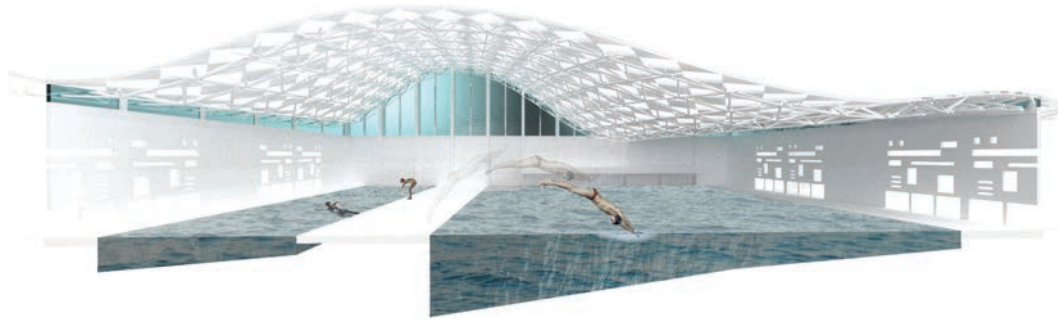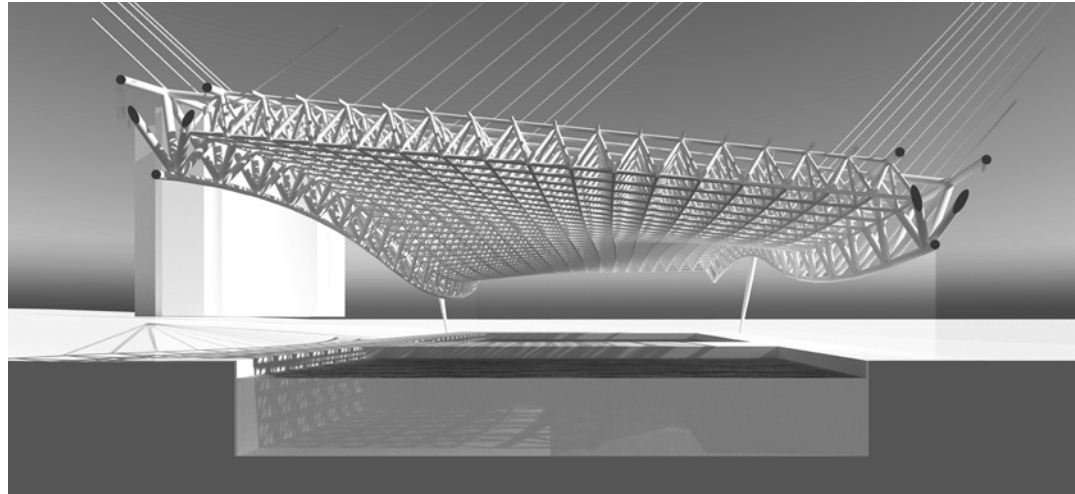
Topics
*   Synthesis and systems integration
*   Thermal and hydrothermal analysis of building envelope
*   High-performance envelope and system strategies
*   HVAC Psychrometrics. Refrigeration. IAQ issues and ventilation
*   HVAC systems, distribution, layout
*   Passive-friendly mechanical and integration strategies
*   Mixed mode cooling. Energy modeling workshops
*   PV and green power. Energy and carbon balance
*   Conceptual lighting design, ambience, and quality
*   LEED and environmental criteria

Project Examples: Energy modeling of active and passive heating, cooling, ventilation and lighting systems. Simple HVAC layout. Green power. Energy and carbon balance calculation.

2014 NAAB criteria. B.2 Site Design / B.6 Environmental Systems   / B.7 Building Envelope Systems and Assemblies / B.8 Building Materials and Assemblies
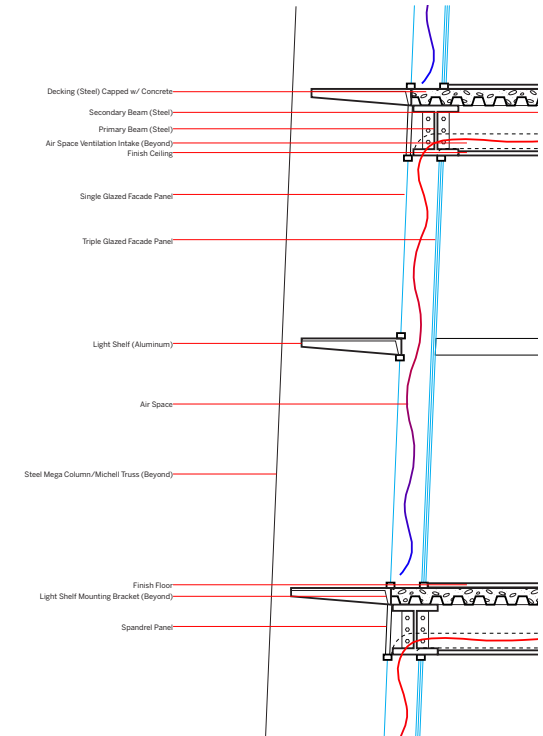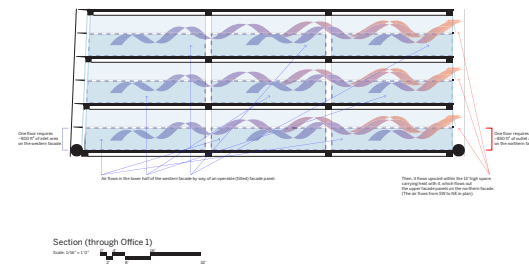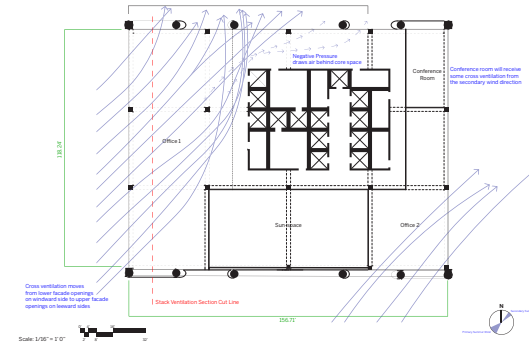
T 7

3RD YEAR SPRING

DESIGN IMPLEMENTATION III SYSTEMS

Student Work: Group projects re-imagining the roof structure of an aquatics center.

Student Work: Moment diagram for a system of beams.

Student Work: Shear diagram for a system of beams.

Student Work: Compression/Tension diagram for a parallel truss.

T 8/9

3RD YEAR SPRING

PERFORMATIVE DESIGN

PASSIVE/ACTIVE SYSTEMS

Student Work: Exploded axon showing passive heating methods.

Student Work: Cross-ventilation plan and section drawings.

Student Work: Double curtain wall facade detail section.
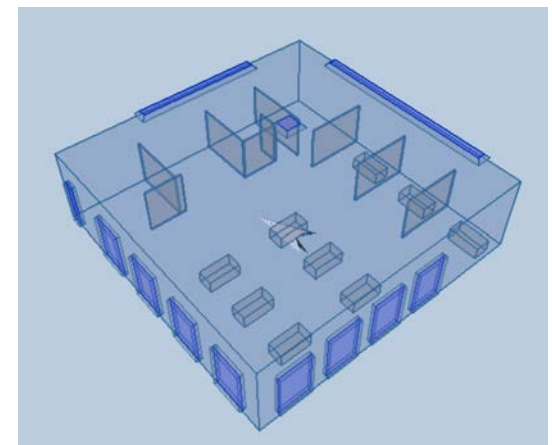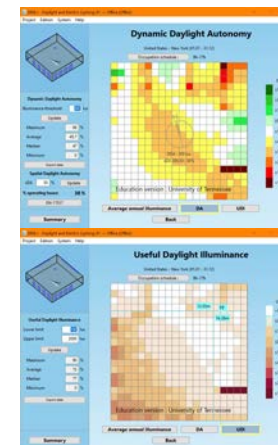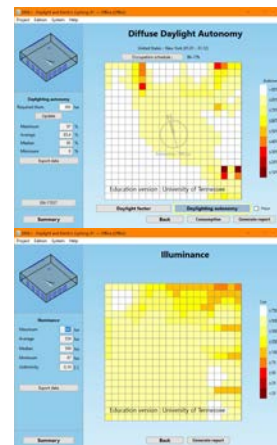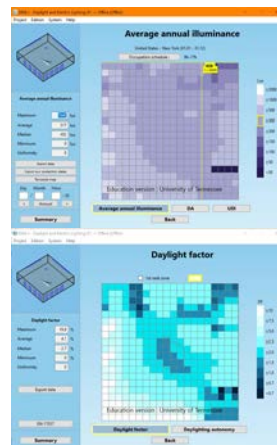
Student Work: Various charts depicting various lighting metrics, both passive and active strategies.

3RD YR SPRING

STUDIO WORK

Activities in the companion technology courses complement and advance student design ideas and strategies.
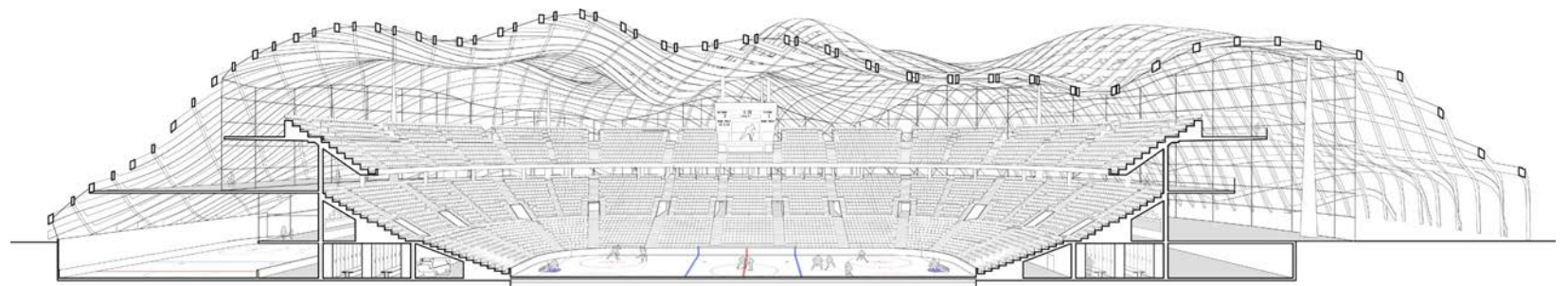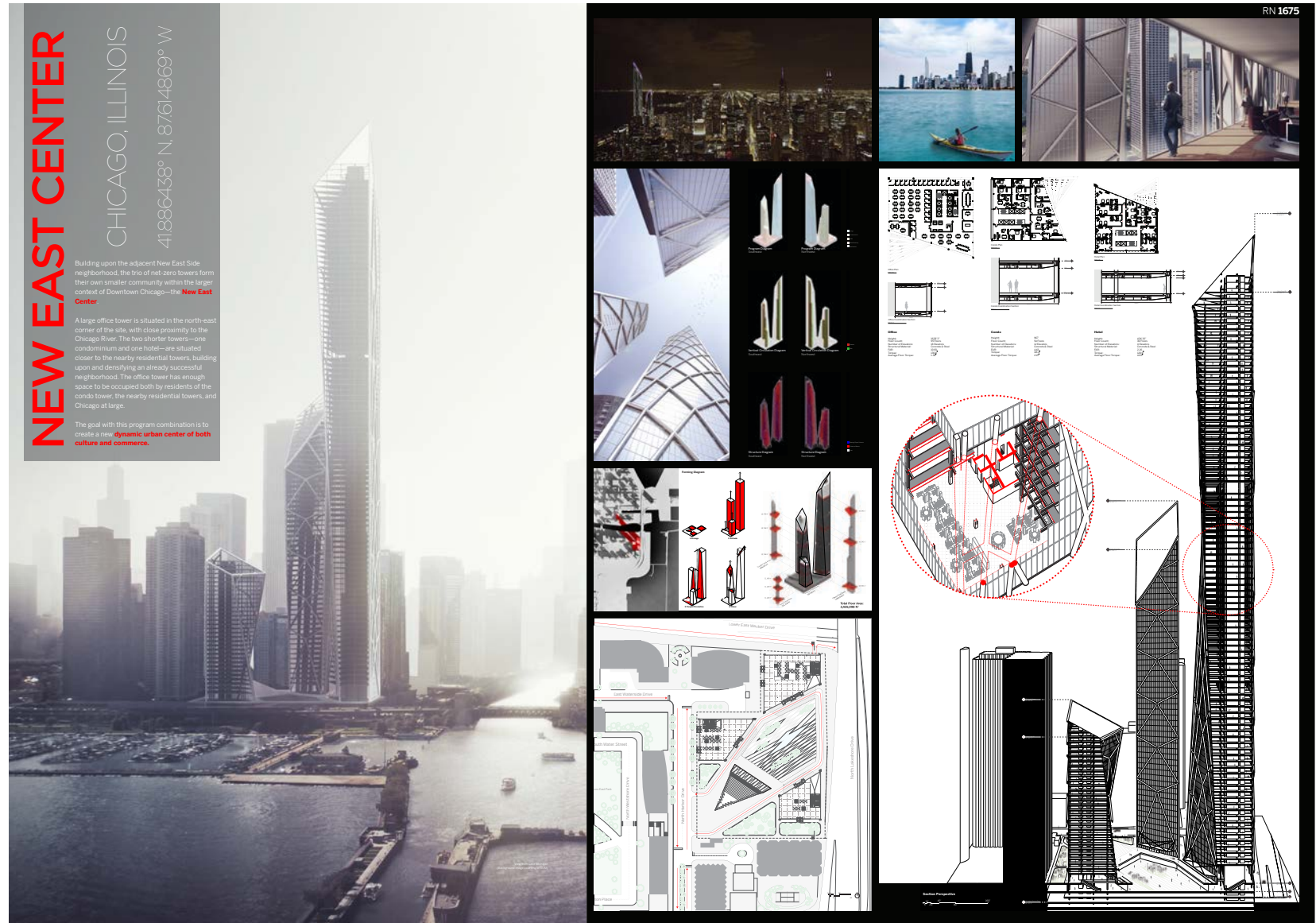
NEW EAST CENTER

CHICAGO, ILLINOIS
41.886438° N, 87.614869° W

Building upon the adjacent New East Side neighborhood, the trio of net-zero towers form their own smaller community within the larger context of Downtown Chicago—the **New East Center**

A large office tower is situated in the north-east corner of the site, with close proximity to the Chicago River. The two shorter towers—one condominium and one hotel—are situated closer to the nearby residential towers, building upon and densifying an already successful neighborhood. The office tower has enough space to be occupied both by residents of the condo tower, the nearby residential towers, and Chicago at large.

The goal with this program combination is to create a new **dynamic urban center of both culture and commerce.**

4TH YR

INTEGRATION STUDIO

The "Integration Studio" has long been a distinguishing feature of the School's curriculum. The studio course has a companion technical course which helps to synthesize technical considerations into the final design. Students typically work in teams of two or three.

In many ways, this pair of co-requisite studio and technology courses served as a model for the entire technology curriculum overhaul.

Over the years, architecture students in the Integration Studio have won many national awards:

STUDIO
INTEGRATION DESIGN STUDIO

Arc 471   6ch   Integration Design Studio

Design project from conceptual through design development phase. Specification of component building systems including structures, mechanical, lighting, and construction details. Demonstration of principles of sustainability in design and building performance

Course format
This is a required design course taught in multiple sections. This course has a significant interaction with its co-requisite, 461. In addition, the course relies heavily upon prerequisite courses in the various component building systems.

The three concurrent courses, Arc 421, 461, and 471, provide the primary compliance for the many NAAB requirements related to comprehensive design.

Topics / Requirements
Concept design
• Conceptual clarity and generation of alternatives
• Response to program and site.
• Spatial organization of design

Sustainable issues are emphasized throughout the entire process and in Arc 461
• Understanding and analysis of sustainable design strategies.
• Response to site context and issues of sustainability
• Impact of building systems and building performance on issues of sustainability

Building Systems Design
• Analysis of building systems
• Conceptual clarity and conceptual development related to tectonics
• Spatial characteristics of design related to building systems

• Design development related to design issues outlined above
• Suitability of technical system selection and integration
• Suitability of materials and integration into design

Individual assignments that relate to different building systems, wall assemblies, life safety analysis, accessibility analysis, and other issues are required throughout the semester.

Technical Documentation and Representation of Design
• Clear description of project design and building systems
• Conformance with building and accessibility codes
• Three-dimensional representation of project.
• General resolution and development of the design
• Innovation
• Completeness, accuracy and clarity
• Appropriate presentation techniques
• Final presentation includes diagrams, wall sections

2014 NAAB criteria. C.1 Research. C.2 Integrated Evaluations and Decision-Making Design Process. /. C.3 Integrative Design

T-10
INTEGRATION OF BUILDING SYSTEMS IN DESIGN

Arc 461 3 ch   Integration of Building Systems in Design

Case study analysis and selection of structural and mechanical systems, investigating the conceptual integration of technical information into a unified design solution, addressing principles of sustainable design.

Course format
Companion seminar and technical lab format in conjunction with design studio Arc 471. Faculty pairs typically link the 431 and 471 courses.

The three concurrent courses, Arc 421, 461, and 471, provide the primary compliance for the many NAAB

requirements related to comprehensive design.
Content
In the students' design projects, the conceptual and design impact of the following will be addressed:
• Alternative design strategies related to technical systems
• Structural system(s) and their inherent spatial characteristics
• Mechanical systems: HVAC, electrical, lighting, acoustics
Comprehensive sustainable strategies are a core focus:
• Understanding of building performance
• Relationships between the building and its systems
• Materials, enclosure, and wall systems
• Consideration of construction and life cycle cost issues
• Site, context, and environmental factors.
• Use of the LEED rating system as metric for evaluating building performance and sustainable design.
Relevant codes:
• Egress, structural, fire safety, disability, zoning, etc.

As a co-requisite to a studio project, this course incorporates sustainable issues from previous semesters, including solar considerations, cross ventilation, understanding of site and climate, use of materials, and detailing of the building envelope.

Requirements
The 461 final presentation is due at the same time as the 471 project and includes the following:
• Written code analysis for the proposed design
• Configure a structural framing plan and size components
• Configure an HVAC layout and describe components
• Demonstrate a design response to principles of sustainability

2014 NAAB criteria. B.3. Codes and Regulations. B.4 Technical Documentation. B.5 Structural Systems. B.6 Environmental Systems. B.7 Building Envelope Systems and Assemblies: B.8 Building Materials and Assemblies. B.9 Building Service Systems. C.1 Research. C.2 Integrated Evaluations and Decision-Making Design Process
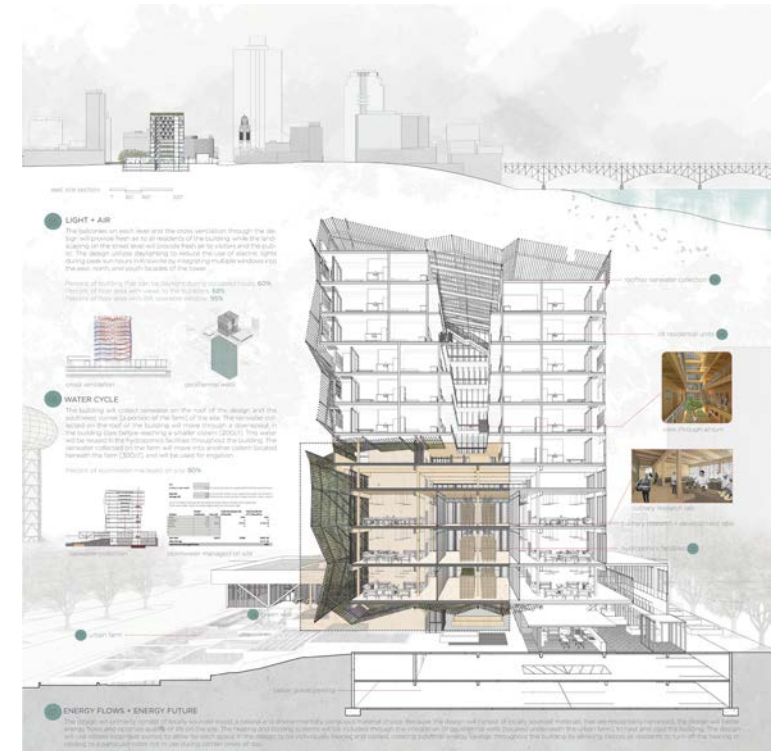
4TH YR

INTEGRATION STUDIO

The "Integration Studio" has long been a distinguishing feature of the School's curriculum. The studio course has a companion technical course which helps to synthesize technical considerations into the final design. Students typically work in teams of two or three.

In many ways, this pair of co-requisite studio and technology courses served as a model for the entire technology curriculum overhaul.

Over the years, architecture students in the Integration Studio have won many national awards.

AIA COTE Top Ten for Students
2017
Gastronomia

GASTRONOMIA: SUSTAINABLE AGRICULTURE

4TH YR

INTEGRATION STUDIO

The "Integration Studio" has long been a distinguishing feature of the School's curriculum. The studio course has a companion technical course which helps to synthesize technical considerations into the final design. Students typically work in teams of two or three.

In many ways, this pair of co-requisite studio and technology courses served as a model for the entire technology curriculum overhaul.

Over the years, architecture students in the Integration Studio have won many national awards.

AIA COTE Top Ten for Students
2015
Leap Collaborative

LEAP COLLABORATIVE

KNOXVILLE, TN

MAKESHOP

TRANSPARENCY THE THINK TANK

BROKE SPOKES COMMUNITY BIKE SHOP WEATHERING

01 DESIGN & INNOVATION

02 REGIONAL/ COMMUNITY DESIGN

03 LAND USE & SITE ECOLOGY | NATIVE TN PLANTINGS:

04 BIOCLIMATIC DESIGN

05 LIGHT & AIR

06 WATER CYCLE

07 ENERGY FLOWS & ENERGY FUTURE

08 MATERIALS & CONSTRUCTION

09 LONG LIFE, LOOSE FIT

10 COLLECTIVE WISDOM, FEEDBACK LOOPS
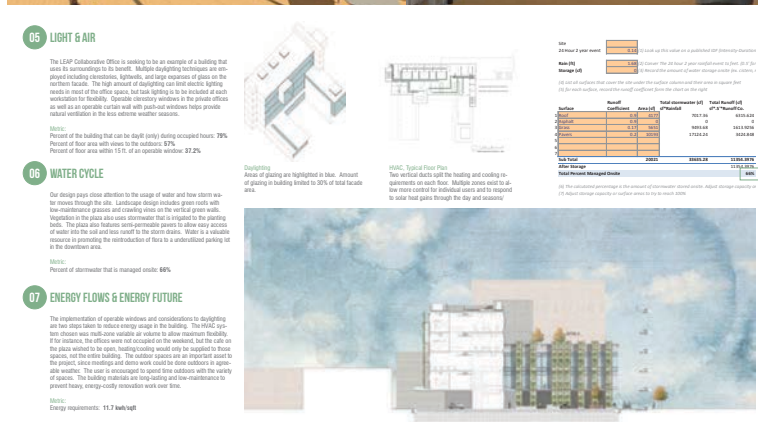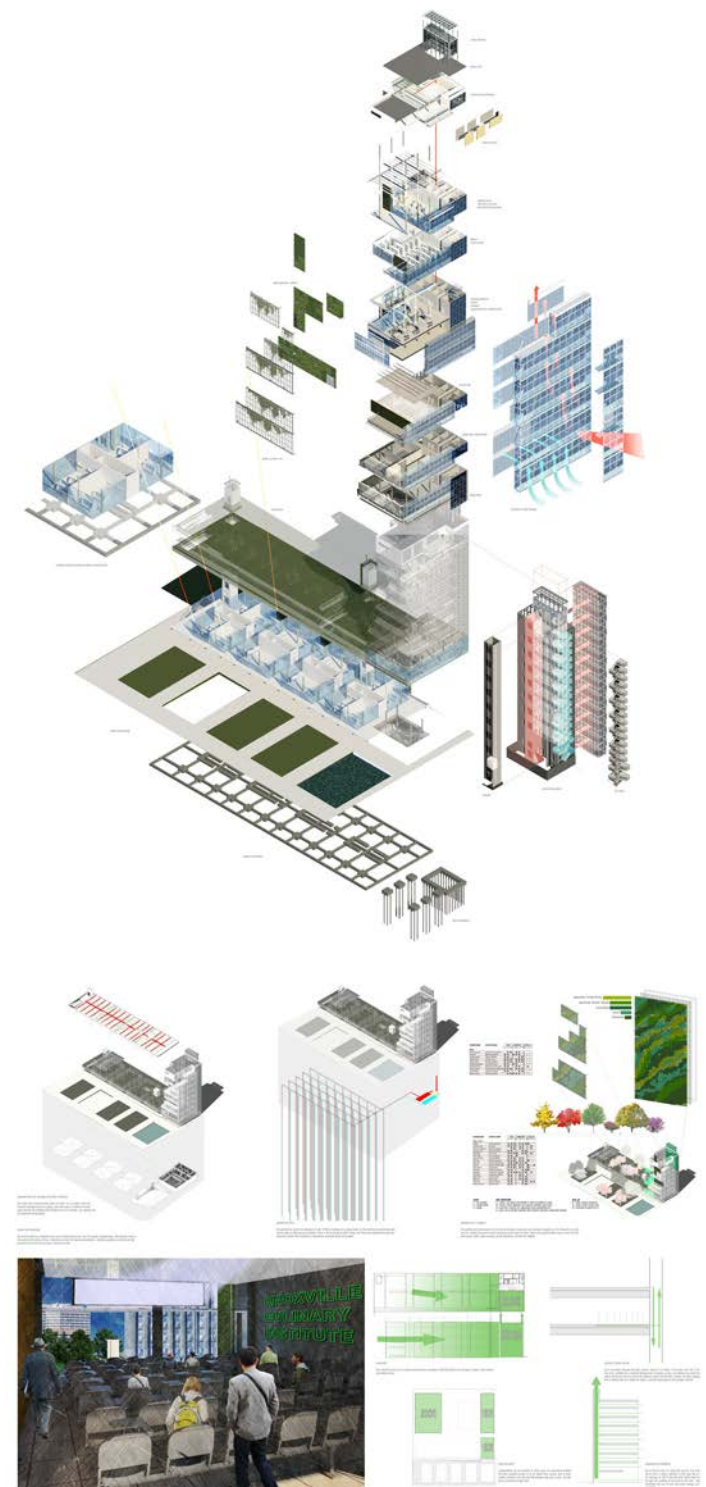
PROGRAM BREAKDOWN

4TH YR

INTEGRATION STUDIO

The "Integration Studio" has long been a distinguishing feature of the School's curriculum. The studio course has a companion technical course which helps to synthesize technical considerations into the final design. Students typically work in teams of two or three.

In many ways, this pair of co-requisite studio and technology courses served as a model for the entire technology curriculum overhaul.

Over the years, architecture students in the Integration Studio have won many national awards.

AIA COTE Top Ten for Students
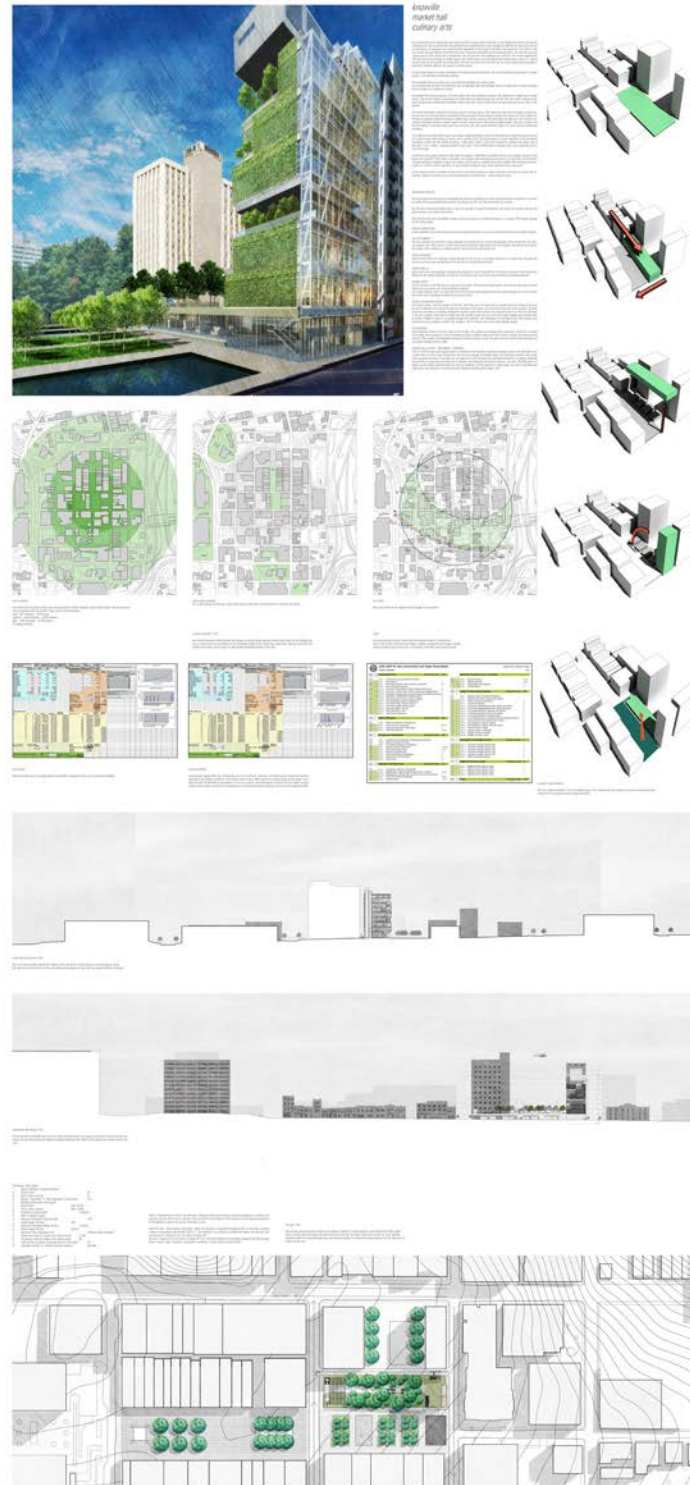2015
Urban Market + Culinary School

4TH YR

INTEGRATION STUDIO

The "Integration Studio" has long been a distinguishing feature of the School's curriculum. The studio course has a companion technical course which helps to synthesize technical considerations into the final design. Students typically work in teams of two or three.

In many ways, this pair of co-requisite studio and technology courses served as a model for the entire technology curriculum overhaul.

Over the years, architecture students in the Integration Studio have won many national awards.

AIA COTE Top Ten for Students
2015
Urban Market + Culinary School
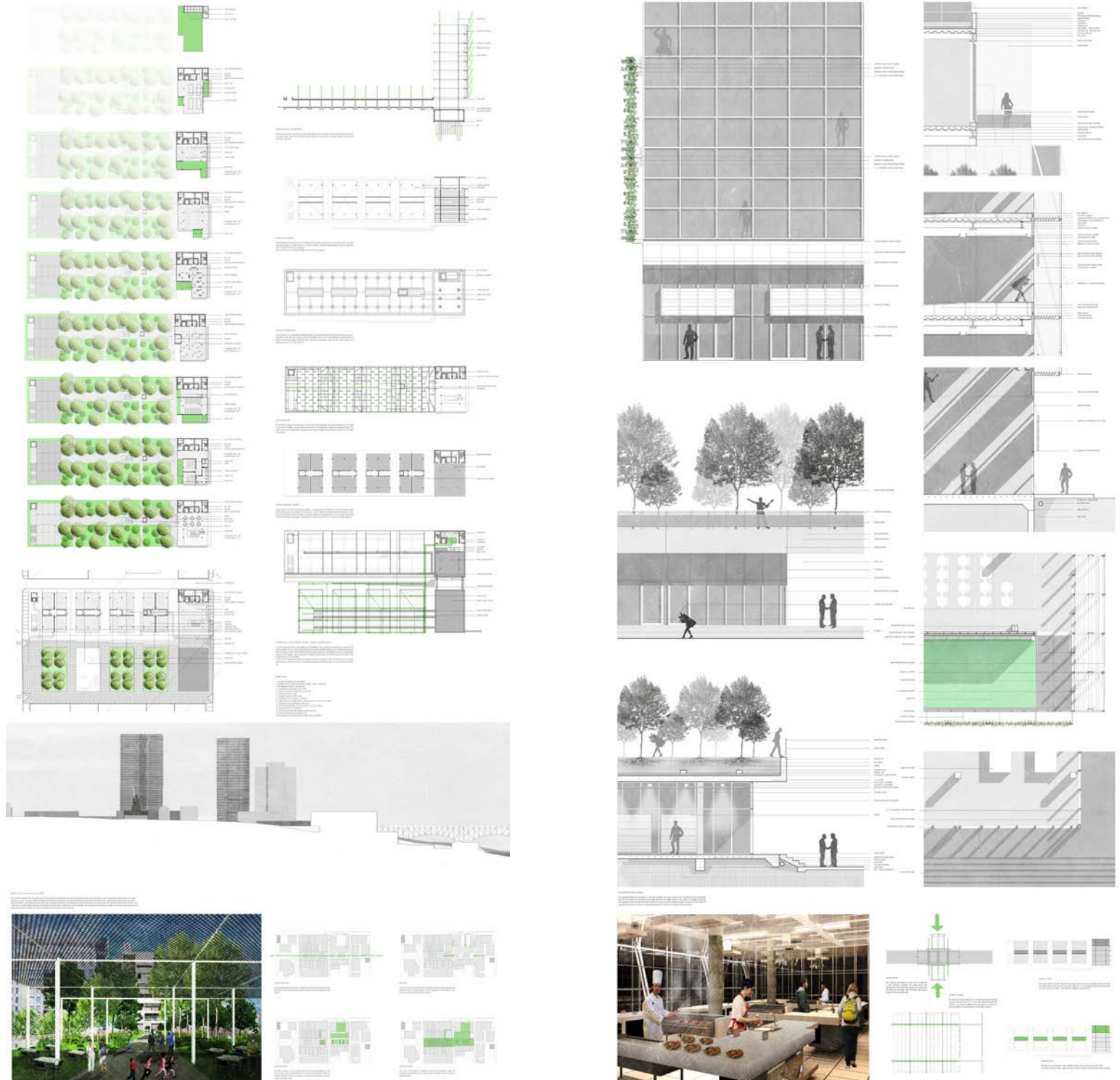
LESSONS LEARNED

Critical Assessment

With a desire to re-conceptualize the paradigm related to a new design / technology curriculum, the faculty at X University embraced the risks involved in this curriculum overhaul.

The debates, and compromises, during the process of redefining the curriculum created a stronger collaborative sense of mission. Faculty wanted to support an innovative learning platform for the students. Respect for different pedagogical and ideological differences underlay the general faculty approach to coursework.

The faculty teaching teams of generalists, in addition to occasional course workshops from "specialists", insured multiple perspectives in each of the new courses.

Scheduling was a significant challenge related to the success of these new courses. Students needed course time in their classes to make progress on assignments, and yet they needed free time for all their course work, design, and personal lives. This new pedagogical model required time management, for both students and faculty. Each successive iteration of the courses has improved.

The student experience has not been monolithic, nor consistent. Yet, the student experience has been reasonably coherent. Sometimes the technology content of blended topics might relate directly to the current studio, or might create foundational awareness for a future studio. Because of the stark differences in design studio agendas, students see similar goals addressed in significantly different ways. This in itself is an important form of cross-referential peer learning.

Competitions and awards

For many years, Fourth Year student work from the well-established "Integration Studio" has won recognition in national student award programs, such as the ACSA Steel Competition or the AIA COTE Top Ten Awards. (See examples of student winners in this submission.) Faculty encouraged Second and Third Years students to submit their work in different competitive venues. On the campus, Second Year students have often received awards in the "Exhibit of Undergraduate Research and Creativity" for their work in these courses.. In 2018, a second year student received one of three national competition prizes ($5000) for a "residential design of the future", with an environmental analysis, based on this course work.

Student Feedback

We have a variety of strategies for soliciting student evaluations and surveys in the different courses.

Students tend to be very positive about the many components of the course, to varying degrees. When asked about the "three best strengths" in some of the new courses,students had many replies:
- Being exposed to diverse topics and faculty
- Understanding the impact of technology on design
- Understanding the layering of wall sections, materials, and performance
- Understanding and visualizing structural systems
- Rising to the challenges of various software programs
- Appreciating the longer assignments in the different courses especially when these assignments related to studio work

The student's perception of the main weakness of these courses was rather consistent, with comments such as: "sometimes the course seemed jumpy" and "we moved from topic to topic too quickly." Time management is always a concern. While students often felt that the courses seemed "fragmented", they also understood the synthetic value related to their design work. The positives outweighed the negatives by a clear margin.

The older students reported wishing they had experienced the new curriculum. Students also reported that second year wall sections were a strong addition to their portfolios, impressing architects in job interviews. In consultation with an educational specialist, we plan a comparative assessment of the old and new curriculum, to be initiated by January 2020.

Summary

In many ways, the interweaving topic trajectories of blended and reiterative content creates a conceptual network for developing a sensibility in which design and technology are inseparable. The faculty continually reassess, critique, and revise the learning experiences in this new curriculum.