

# ARCHITECTURE (ARCH)

## ARCH 0101 Making Space: Feminism and Architecture

This undergraduate seminar will consider feminist frameworks, politics, and aesthetics in relation to architecture and the built environment. How have theories on the feminine, and gender more broadly, influenced architectural thought and design aesthetics? How can we imagine a more just environment for women in communities, workplaces, homes, public spaces, and institutions? Spanning from the 1970s to the present, the seminar will engage with texts, case studies, and experimental practices, with a focus on their implications for present and future work. The course will also consider the intersections of feminist thought with broader concerns of gender, class, race, and ability, and will explore the role of feminism in global and local solidarities. Students from all disciplines are encouraged to enroll. The course will be structured around weekly discussions of readings and case studies, peer feedback sessions, and student presentations. Students will undertake a guided research project of their choosing, which may take the form of a critical or experimental essay, performance, or a visual, spatial, or graphic project.

Fall

1 Course Unit

## ARCH 0110 Design, Race, and Climate Justice

Through a critical and historical lens, students will examine material, spatial, and ecological practices in architecture and design that perpetuate racial inequities and exacerbate climate injustices. This course will challenge students to consider the ways in which design decisions negatively impact black, indigenous, and other people of color, while also causing harm to the environment. The extraction of raw materials for production often leads to the displacement of communities, destruction of habitats and ecosystems, and the depletion of finite natural resources. Historically, urban planning and design has been used to enforce racial segregation and deny access to services and amenities to non-whites. The siting of toxic waste facilities, highways, and industrial zones in low-income communities of color has had devastating impacts on public health and quality of life. Probing the intersectional relationships between design, race, and climate change, students will engage with a range of texts, multimedia content, case studies, and hands-on projects. By the end of the semester, they will have a deeper understanding of the ways in which design impacts communities and the environment and be equipped with knowledge to advance a more just, equitable, and resilient future.

Fall

1 Course Unit

## ARCH 0201 Land Practice

This seminar introduces students to the relevant topics, themes, and sites that help us understand the conception, production, and evolution of designed landscapes throughout the eighteenth, nineteenth, and twentieth centuries, with a focus on North America. We aim to build an understanding of landscapes as both physical spaces and cultural constructions at the nexus of art and science. We also explore how our understanding of landscapes contributes meaning to our relationships with nature and more-than-human species. The seminar examines the development of the designed landscape in the United States, beginning with Thomas Jefferson's Notes on the State of Virginia (1785) and foregrounding the entangled roles of the plantation economy, Indigenous knowledge, and colonialism. The study of Andrew Jackson Downing and Frederick Law Olmsted presents an entry point for examining the landed gentry and the laboring classes through Olmsted's nineteenth-century journalist's perspective in The Cotton Kingdom (1861) as well as the public health narratives that emerged with the construction of Central Park on the cusp of the Civil War. The early twentieth-century development of national parks and the narrative of the American wilderness are considered as parallel to the ongoing displacement of Indigenous peoples; the course also examines contemporary scholarship on traditional ecological knowledge and pluriverse worldviews. An expanded view of urban ecology and landscape performance will bring us to the launch of the environmental movement and the first Earth Day, held in Philadelphia at Fairmont Park in 1970. Literature, poetry, and performance art are included as part of a holistic approach to reading and exploring land practice.

Spring

1 Course Unit

## ARCH 1010 Introduction to Design

An investigation of an object-oriented design process utilizing digital drawings, rapid prototyping, and digital fabrication techniques. This course introduces design as a creative act marking out a synthesis based on observation of a problem, interpretation of possibilities, and translation of a concept into meaningful three-dimensional objects that engage with society and social justice. The course includes a weekly lecture and studio component.

Fall

Also Offered As: DSGN 1011

1 Course Unit

## ARCH 1020 Introduction to Architecture

An exploration of the design process utilizing drawing and model-making techniques. Skills of representation and fabrication are introduced in the context of the development of each student's capacity to observe, interpret, and translate design concepts into physical form. The course includes a weekly lecture and studio component. The primary purpose of this course is to introduce the fundamental concepts and basic skills necessary in the design of a work of architecture. Fundamental concepts include a basic understanding of description, projection, and fabrication – in both two and three#dimensions. Basic skills include freehand sketching and drawing, computer#aided drawing (orthographic and axonometric) and the fabrication of scale models using hand, power, and digital tools.

Spring

1 Course Unit

**ARCH 1201 Languages of Landscape: Global Perspectives on the Meaning of Landscape and Place**

Languages of Landscape introduces the history and theory of landscape through a global survey of concepts about the meaning of landscape and place. It is a seminar course that addresses the meaning of landscape and place through historical and theoretical contexts: philosophy, mythology, social and environmental justice, the Anthropocene, ecology, natural science, horticulture, religion, belief, art, industry, literature, colonialism, utopianism, agriculture, and gardens. The course will also survey places as they are or have been palimpsests evolving through time and human occupation. Both real and imagined ideas of landscape and place will be considered.

Fall

1 Course Unit

**ARCH 1301 Architectural Representation: Stories and Strategies**

This course examines architectural representation as both a storytelling medium and a sociocultural practice, analyzing how drawings shape design ideologies, spatial narratives, and collective memory. Architectural imagery operates as both a tool of precision and a means of conceptual speculation, raising questions about whose stories are told through representation and how these narratives influence the built environment. Through critical engagement with historical and contemporary case studies, students will gain a deeper understanding of how architecture functions as a language of power, identity, and advocacy. The course begins with foundational works, contrasting Chinese isometric drawings, which challenge Western perspectival norms, with Giovanni Battista Piranesi's *Carceri d'Invenzione* (1761), where spatial distortion imagines impossible architectures. It then expands representation's role beyond architecture to examine W.E.B. Du Bois's *The Exhibit of American Negroes* (1900), which reimagines data visualization as a form of spatial storytelling, demonstrating how non-traditional mediums critique power structures and expand architectural discourse. Frank Lloyd Wright's *Wasmuth Portfolio* (1910) anchors a discussion on architectural imagery's global influence, while Zaha Hadid's axonometric experiments and Robin Evans' *Translations from Drawing to Building* (1997) explore how abstraction mediates between idea and form. Modern case studies, including Mario Carpo's *The Alphabet and the Algorithm* (2011), contextualize digital tools' disruptive role in design. Through drawing workshops and discussions, students will experiment with collage, texture mapping, generative AI, and other mixed-media techniques to create representations that engage urgent themes of equity, identity, and ecology. The course culminates in critical writing reflections on architecture's responsibility to amplify marginalized narratives and spatialize collective futures. By framing architectural representation as both a creative and ethical practice, students will develop design portfolios that go beyond technical skill, embracing architecture's capacity to question, provoke, and advocate.

Spring

1 Course Unit

**ARCH 2010 Design Fundamentals I**

This studio course develops drawing and model-making skills with emphasis on digital representation and digital fabrication. The capacity of nature-inspired design is explored as a foundation for the creative production of new forms of expression. As the second course in the five-semester cumulative sequence of required design studios, ARCH 2010 is preceded by ARCH 1020, an exploration of orthogonal geometry and orthographic and axonometric projection. ARCH 2010 focuses on the non-orthogonal geometries of animate form as the basis for the development of analogical and prototypical structures utilizing 3D digital modeling software and digital fabrication. In ARCH 2020, the design studio following ARCH 2010, students explore the movement of the body as a basis for design.

Fall

Prerequisite: ARCH 1010 AND ARCH 1020

1.5 Course Unit

**ARCH 2020 Design Fundamentals II**

A studio course exploring the relationship between two-dimensional images and three-dimensional digital and physical models. This studio course develops advanced techniques in digital representation and fabrication through an investigation of the theme of inhabitation in architecture. In the previous semester (ARCH 2010), you looked to nature to study, analyze and then translate complex geometry as it occurs in the natural world. This biomorphic study laid the foundation to learn how to describe non-Euclidean geometries through drawing techniques. Building on this knowledge, in ARCH 2020 you will learn to collect data by carefully mapping a body's movement during a specific activity. You will analyze, document and ultimately represent this data through drawing. Through this process, you will build an understanding of how a body in motion inhabits space. The range of motion your body maps will be the frame of reference to design a site-specific architectonic enclosure. You will continue to expand your knowledge of digital drawing and fabrication tools using Rhino as your primary 3D modeling software as well as V-Ray for rendering.

Spring

Prerequisite: ARCH 2010

1.5 Course Unit

**ARCH 2101 Concepts for Understanding Space in the Americas**

To study the built environment of the Americas is to deal with an inherent contradiction. While our disciplines of architecture, urban design, landscape, and planning share the fundamental belief that spaces matter; an overwhelming majority of our knowledge comes from another continent. As reminded by Edward Said in the classic "Orientalism" of 1974, European culture developed narratives about all other societies on Earth and as a result established itself as the center of human knowledge. One could easily apply Said's orientalism to a certain "occidentalism" of the American continent and we shall ask what such narrative entails. According to the Eurocentric narrative, the Americas were a vast continent empty of sophisticated cultures and ready to be conquered by superior knowledge of the self-proclaimed "old world". This course looks into an array of spatial concepts developed by Americans (understood here of course as anyone who is rooted in the continent, from Chile to Alaska); in order to provide Penn undergraduate students with the intellectual tools to understand such spaces.

Spring

1 Course Unit

**ARCH 3010 Architecture Design I**

An introduction to the design of architecture in the city. Students explore the relationships between two-dimensional patterns and their corresponding three-dimensional interpretations through the orthographic drawings of plan, section, and elevation and three-dimensional digital and physical models. ARCH 3010 focuses on Architecture's connective role as a whole comprised of parts (a building comprised of components) a contributing part of a whole (a building within an urban, suburban, or rural environment).

Fall

Prerequisite: ARCH 2020

2 Course Units

**ARCH 3020 Architecture Design II**

An introduction to the design of architecture in the landscape. Issues of mapping, placement, scale, and construction are explored through studio design projects, site visits, and discussions. Course work focuses on the preparation and presentation of design projects emphasizing analytical skills along with the development of imaginative invention and judgment.

Spring

Prerequisite: ARCH 3010

2 Course Units

**ARCH 3030 Design Fundamentals**

The creation of a successful product requires the integration of design, engineering, and marketing. The purpose of this intensive studio course is to introduce basic concepts in the design of three-dimensional products. For purposes of the course, design is understood as a creative act of synthesis expressed through various modes of 2-dimensional and 3-dimensional representation. The course develops basic design skills ranging from hand sketching to the use of digital modeling software and rapid prototyping. Fulfills the requirement for a design background course in the interdisciplinary graduate program in Integrated Product Design (IPD).

Summer Term

1 Course Unit

**ARCH 3101 Spatial Reparations: Material and Territorial Practices of Justice**

This interdisciplinary seminar will look at the ways in which acts of historical repair and justice have been materially negotiated through landscapes, sites, buildings, and objects. Historic and collective trauma – from the injustices of colonialism, slavery, war, dispossession, genocide, and ecocide – often involves multiple, interconnected scales of harm, and accordingly demands responses that consider multiple forms of healing. Forms of repair might include the restoration of a local ecosystem, the establishment of an archive, the preservation of a building or street, legal acknowledgement of heirs, the transfer of property rights, or the repatriation of artworks. This course will consider these interdisciplinary approaches and strategies of redemption through both readings and case studies. Case studies will be international in scope and will focus on the ways in which an engaged approach to history can inform responses through landscape, community activism, architecture, monuments, artworks, exhibitions, or archives. Students are not required to have a background in architecture, and students from different disciplinary backgrounds and interests are encouraged to participate. One of the goals of this course is to explore how architectural, urban planning, and landscape approaches to reparations offer forms of knowledge that are productive for other fields. But we will also look at how different disciplines can contribute unique responses to addressing historical trauma and injustice. Classes will consist of weekly discussions of readings, peer feedback on final projects, and student presentations chosen from suggested case studies. As a final project, students may write a research or critical essay, or may produce a visual or graphic work that includes a written component.

Spring

1 Course Unit

**ARCH 3110 Theory I**

Theory I offers an introduction to key topics in architectural theory, providing students with a foundational understanding of the discipline. Through readings, case studies, and diverse materials, participants will critically reflect on issues of contemporary relevance within the field of architecture. This course equips students with essential tools for thoughtful analysis and creative engagement in architectural discourse.

Fall

1 Course Unit

**ARCH 3302 Thinking through Making**

This course will consider the architectural model as an Interrogatory, exploratory, documentary, and/or revelatory device through historical and contemporary lenses. Intended for both majors and non-majors, this introduction to the role of making in architectural production will provide students with a foundational understanding of the ways in which architects interpret, understand, and develop their work through tactile engagement with the material world. A focus on three dimensional representation will encourage students to consider the work of others while building individual skills in, and familiarity with, the workshop as a place of production, exploration, and possibility.

1 Course Unit

**ARCH 3800 Topics In Architecture**

The topics courses offer a timely exploration of issues of contemporary relevance within the discipline of architecture. These introductory seminars engage with a diverse range of themes that vary by semester and instructor. Open to all undergraduate students.

1 Course Unit

**ARCH 3801 Topics In Landscape**

This course offers a timely exploration of issues of contemporary relevance within the area of landscape studies. Specific content will vary by semester and instructor. Open to all undergraduate students.

1 Course Unit

**ARCH 3802 Topics in Theory**

This course offers a timely exploration of issues of contemporary relevance within the area of architectural theory. Specific content will vary by semester and instructor. Open to all undergraduate students.

1 Course Unit

**ARCH 3803 Topics in Representation**

This course offers a timely exploration of issues of contemporary relevance within the area of architectural representation. Specific content will vary by semester and instructor. Open to all undergraduate students.

1 Course Unit

**ARCH 3804 Topics in Technology**

This course offers a timely exploration of issues of contemporary relevance within the area of architectural technology. Specific content will vary by semester and instructor. Open to all undergraduate students.

1 Course Unit

**ARCH 4010 Advanced Design Workshop**

Advanced design course that engages contemporary contexts of architecture through historical, socio-cultural, and environmental frameworks. Students develop skills for collaboration, self-evaluation, and peer critique while learning how to effectively communicate design ideas to a public audience.

Fall

Prerequisite: ARCH 3020

2 Course Units

**ARCH 4020 Advanced Design Seminar**

ARCH 4020: Advanced Design Seminar builds on projects and student work completed in ARCH 4010: Advanced Design, refining the studio projects in consideration of real-life constraints and opportunities. It allows students to develop in-depth research and design skills in partnership with community groups and/or industry partners. Addressing questions of design feasibility that extend beyond the scope of an architecture design studio, students will learn how issues such as economics, financing, constructability, design standards, zoning, and building codes ultimately impact the evolution of a project. Students will sharpen their communication and representation skills while creatively responding to the constraints and opportunities inherent within the practice of architecture.

Spring

1 Course Unit

**ARCH 4120 Theory II**

Theory II explores advanced topics in architectural theory. Through readings, case studies, and multi-media materials, students will explore contemporary concerns within the discipline of architecture in relationship to other areas of knowledge. By engaging with complex issues, students will hone their analytical abilities and develop a critical lens through which to examine architectural thought and practice.

Spring

Prerequisite: ARCH 3110

1 Course Unit

**ARCH 4310 Construction I**

Lecture course exploring the basic principles of architectural technology and building construction. The course is focused on building material, methods of on-site and off-site preparation, material assemblies, and the performance of materials. Topics discussed include load bearing masonry structures of small to medium size (typical row house construction), heavy and light wood frame construction, sustainable construction practices, emerging + engineered materials, and integrated building practices. The course also introduces students to Building Information Modeling (BIM) via the production of construction documents.

Fall

Mutually Exclusive: ARCH 5310

.5 Course Units

**ARCH 4320 Construction II**

A continuation of Construction I, focusing on light and heavy steel frame construction, concrete construction, light and heavyweight cladding systems and systems building.

Spring

Mutually Exclusive: ARCH 5320

1 Course Unit

**ARCH 4330 Building Systems Integration**

What makes buildings livable and buildable. After the initial concept design and massing studies are complete the next step is detailing. This seminar will examine the detail, how they can inform and enhance a building's design. The primary goals of a building is that it stands up to external forces, protects inhabitants from the elements and provides a healthy environment. This course will look at the individual components of structure, skin and systems. More importantly though, it will examine the connections between them. The class will begin with lectures examining the different systems and then progress into applying these ideas as a whole to individual studio projects. The final results of this course will be a 3D wall section with accompanying details. These details will be developed in a variety of software as chosen by the student. Recommended options are Revit, Rhino, AutoCAD.

Fall

0.5 Course Units

**ARCH 4350 Structures I**

Theory applied toward structural form. A review of one-dimensional structural elements; a study of arches, slabs and plates, curved surface structures, lateral and dynamic loads; survey of current and future structural technology. The course comprises both lectures and a weekly laboratory in which various structural elements, systems, materials and technical principles are explored.

Fall

Mutually Exclusive: ARCH 5350

.5 Course Units

**ARCH 4360 Structures II**

A continuation of the equilibrium analysis of structures covered in Structures I. The study of static and hyperstatic systems and design of their elements. Flexural theory, elastic and plastic. Design for combined stresses; prestressing. The study of graphic statics and the design of trusses. The course comprises both lectures and a weekly laboratory in which various structural elements, systems, materials and technical principles are explored. Successful completion of ARCH 4350 is a prerequisite for ARCH 4360.

Spring

Mutually Exclusive: ARCH 5360

Prerequisite: ARCH 4350

Corequisite: ARCH 5990

0.5 Course Units

**ARCH 4998 Senior Thesis**

The architecture senior thesis provides students with the opportunity to undertake an independent critical and speculative exploration of a chosen theme. The theme is required to connect architecture with at least one other discipline or subject in the College of Arts and Science. In addition, the questions formulated should establish a concrete link to debates that can be identified as architectural, whether belonging to the realm of individual buildings, urbanism, or product design. This means, that departing from a humanistic question, students should seek to establish clear connections to architectural discourse in the process of conducting their thesis. The thesis project initiates a set of issues and methods that students may continue to develop as they embark on their future professional and intellectual careers. Although the thesis is conceived independently, it is conducted under the supervision of faculty advisors and the thesis coordinator. For additional information, please contact the Chair of Undergraduate Architecture.

Spring

Prerequisite: ARCH 3010

1 Course Unit

**ARCH 5000 Summer Preparatory Design Studio**

The Summer Preparatory Studio offers an intensive drawing and design experience to candidates for admission to the Graduate Program in Architecture who have not completed the necessary design studio prerequisites or who are required to have additional design experience to qualify for matriculation into the Master of Architecture Professional Degree Program in September. Enrollment in this program does not count towards the Master of Architecture degree. The intent of the drawing component of the course is to familiarize the student with primarily black and white mediums (pencil, charcoal, ink, etc). Exercises are designed to sharpen the student's ability to see selectively and to transform image to paper through both line and tonal renditions in freehand sketch form. Exercises will also familiarize the student with basic drafting skills necessary for architectural communication and provide an introduction to computer-aided design through applications of the intensive Rhino and Illustrator tutorials given in the Digital Navigation course. The design part of the course presents a rhythm of basic three-dimensional design studies and simple architectural studio investigations. These are intended to build fundamental skills and acquaint the student with the architectural issues of form/space, conceptualization, transformation of scale, simple functional and constructional problems and a sensitivity to context. Course enrollment is by permit only.

Summer Term

2 Course Units

**ARCH 5010 Design Studio I**

This course is the first of a four-semester long design sequence that constitutes the core studio curriculum within the Master of Architecture program at the Weitzman School of Design. This studio introduces specific modes of architectural thinking, design, and practice through a set of projects that examine the foundational topics of component order and assembly. The semester will examine part-to-whole relationships through digital design techniques, tectonic and material studies and physical fabrication. The semester will culminate with the design of a small institutional extension that allows students to apply these foundational concepts to architectural space. Successful completion of ARCH 5010 is required to move on to ARCH 5020 in the Studio Sequence.

Fall

Corequisite: ARCH 5210

2 Course Units

**ARCH 5020 Design Studio II**

This studio explores urban architecture as an embodiment of cultural values. Analytical techniques for representing urban conditions are explored extensively. Students are challenged to interact with large, complex programs, individually determining one large component of the assigned program. Siting, enclosure of space and dimensions of public space and commons are stressed in order to challenge students to project relevant and inventive architectural situations. Large scale site and ground plans are stressed in the development of the project. Successful completion of ARCH 5010 is a prerequisite for beginning ARCH 5020. ARCH 5020 must be successfully completed before moving on to ARCH 6010.

Spring

Prerequisite: ARCH 5010

Corequisite: ARCH 5220

2 Course Units

**ARCH 5110 History and Theory I**

This overview of the history of architecture from the mid-nineteenth century through World War II places modern architecture's evolution into global perspective, taking into account not just transformations in architectural aesthetics and building practices around the world but also the broader sociopolitical, economic, technological, environmental, and intellectual forces that influenced them. We consider changing modes of production and reception, disciplinary and institutional innovations, animating debates, and global interdependencies and interchanges. Going well beyond iconic buildings and canonical "isms," we pose the following questions: In what ways did the new architecture of the period respond to, participate in, and mediate the unprecedented experiences of modernizing societies? How did urban and environmental crises, colonial enterprises and devastating wars, national and international agendas, social changes, and technological advances affect architects' understanding of the spaces they were called upon to design? How, in turn, did buildings and projects reflect different societies' self-images and aspirations to become modern? What can architecture's manifestations over the course of this formative period tell us about the emergent modern world? In attempting to answer these questions, we take note of shifting historiographic paradigms and reflect on the genealogical relationship and relevance of this epoch to architectural thought and practice today. A passing grade in ARCH 5110 must be earned before moving on to the next course in the sequence, ARCH 5120.

Fall

1 Course Unit



**ARCH 5120 History and Theory II**

ARCH 5120 continues topics introduced in ARCH 5110, in the midst of World War II, and traces the evolution of architecture culture up to the twenty-first century in the context of an increasingly complex and interconnected world. We are concerned with both material and ideological changes, with key architectural protagonists, projects, and contexts as well as the impact of external historical forces. Lectures move roughly chronologically through a varied array of issues, among them: postwar reconstruction and planning; the culture of the Cold War; the critique of interwar modernism; the emergence of new technologies and postindustrial processes; the burgeoning of suburbanization, consumer culture, and mass media; revisionist and radical approaches to form and space; the rise of new social movements; postmodernism; globalization and the advent of digital culture; and environmental, social, and geopolitical challenges at the turn of the century. As in the previous semester, the course is intended to provide students with a broad knowledge of the architectural history of the period under study and an understanding of architecture's role and agency in a changing world. A passing grade in ARCH 5110 must be earned before proceeding to ARCH 5120.

Spring

Prerequisite: ARCH 5110

1 Course Unit

**ARCH 5210 Visual Studies I**

The coursework of Visual Studies investigates architectural representation as the primary means for communication and development of an architect's work. Alongside the development of fundamental skills are weekly lectures on the history of representation exploring the introduction of new technologies, drawings relation to culture, and the impact on practice of representational turns. The first semester investigates documenting objects and space through orthographic projection and isometric drawing while also moving between virtual and physical space with means including photogrammetry and 3D printing.

Fall

Corequisite: ARCH 5010

0.5 Course Units

**ARCH 5220 Visual Studies II**

The second course in the Visual Studies sequence emphasizes drawings as generative devices which project possibilities rather than just documenting design decisions. Assignments explore image construction through photography and rendering and the construction of a large cutaway section drawing which speculates on the development of the studio project.

Spring

Corequisite: ARCH 5020

0.5 Course Units

**ARCH 5310 Construction I**

ARCH 5310 is the first of two courses explaining Construction Technology. The first course introduces the student to the relationship of design and construction in the creation of buildings. The early lectures trace the evolution and innovation of construction techniques throughout history and around the globe. This is used to ground the course in the kinds of environmental, economic, and technological pressures that have influenced the use of materials and methods in construction. Next, the course presents a primer describing how design and the act of drawing establishes a vocabulary that architects use to describe the construction of buildings. The balance of the course presents the building of a "light scale" building from the ground up; examining the fundamental material and construction concepts related to construction starting with excavation and ending with interior finishes. Bi-weekly labs complement the lectures with site visits to construction sites and trade facilities as well as more focused lessons.

Fall

Mutually Exclusive: ARCH 4310

Corequisite: ARCH 5990

0.5 Course Units

**ARCH 5320 Construction II**

Lecture and Workshop course focused on light and heavy steel frame construction, concrete construction, light and heavyweight cladding systems and systems building. Construction Technology II is an advanced course in building technology and building information modeling that informs, instructs, and demonstrates the extent to which industrialized building systems and innovative building technologies impact and guide the architect's design process. The course focuses on multistory buildings whose complexities require the adoption of varying material, constructional, and informational technologies. Students are guided by teaching assistants in the completion of a set of construction drawings that are reviewed using industry standard red-lining digital techniques.

Spring

Mutually Exclusive: ARCH 4320

1 Course Unit

**ARCH 5350 Structures I**

Theory applied toward structural form. A review of one-dimensional structural elements; a study of arches, slabs and plates, curved surface structures, lateral and dynamic loads; the sizing and selection of materials are undertaken using acceptable standards and code requirements; survey of current and future structural technology. The course comprises both lectures and a weekly laboratory in which various structural elements, systems, materials and technical principles are explored.

Fall

Mutually Exclusive: ARCH 4350

Corequisite: ARCH 5990

0.5 Course Units

**ARCH 5360 Structures II**

The course is continuation of Structures I. A review of two-dimensional structural elements including slabs, plates, walls, curved surfaces, and solid structures are conducted. The sizing and selection of materials is undertaken using acceptable standards and code requirements. Additionally, prestressing and composite systems, materials, and elements are studied. Wind, seismic and flooding events are introduced through lateral stability criteria. A survey of current and future structural technology is undertaken. The course is made up of both lectures and a weekly laboratory in which various structural elements, systems, materials and technical principles are explored. Successful completion of ARCH 5350: Structures I is a pre-requisite for ARCH 5360.

Spring

Mutually Exclusive: ARCH 4360

Prerequisite: ARCH 5350

Corequisite: ARCH 5990

0.5 Course Units

**ARCH 5990 First Year Technology Lab**

ARCH 5990 is a required lab/workshop that accompanies the core technology sequence in the M.Arch program in both the Fall and Spring terms. This lab section will offer additional instruction, workshops, lab time, and other support to the first year technology courses. Enrollment in ARCH 5990 is required for all undergraduate and graduate Architecture students taking the Fall courses ARCH 4310/5310: Construction I and ARCH 4350/5350: Structures I and the Spring courses ARCH 4320/5320: Construction II and ARCH 4360/5360: Structures II.

0 Course Units

**ARCH 6010 Design Studio III**

The third core studio proposes the design of a 50,000 square foot, urban sited building that positions a new urban housing project with an existing structure. Students engage architecture in its role as a cultural agent and examine the way buildings establish and organize dynamic relationships between site, program and building materials. Urban access, relationship to siting, mass-transit, and the larger city will be considered. The curricular goals of the studio include the exploration of building massing, housing unit scale and variation, and the creation of hybrid forms of housing/dwelling as they relate to adaptive reuse and public programs within the urban environment. ARCH 5020 must be successfully completed before beginning ARCH 6010. Successful completion of ARCH 6010 is a prerequisite for starting ARCH 6020.

Fall

Prerequisite: ARCH 5020

Corequisite: ARCH 6210

2 Course Units

**ARCH 6020 Design Studio IV**

The fourth core studio aims to develop students' understanding of building design through the coordination, negotiation, and feedback of multiple constituents and consultants. The integration of site, structure, mechanical systems, envelope, and material are key to the development of the work. The organization of the semester works to give an understanding of how critical input from a host of expertise serves the design process. The students work alongside engineers, material specialists, and other consultants to gain new insight into building and construction constraints, processes, and opportunities. The projects, sited in urban contexts, are 35,000 square foot buildings which engage with the 600 studio wide theme of the Public Commons - a term used for shared, equitable access of all communities to natural resources such as air, oceans and wildlife as well as to social creations such as libraries, public spaces, technology and scientific research. ARCH 6010 must be successfully completed before beginning ARCH 6020. Successful completion of ARCH 6020 is a prerequisite for starting a 7000-level studio.

Spring

Prerequisite: ARCH 6010

2 Course Units

**ARCH 6110 History and Theory III**

This course builds on the previous History/Theory sequence (ARCH 5110 and ARCH 5120), moving from an emphasis on history to focus on contemporary theories of architecture. The goal is to build literacy in contemporary architectural discourse in correlation with design culture. Students will gain awareness of where the field of contemporary architectural theory currently stands, especially in terms of its societal and scientific relevance. Lectures and discussions will look at the aesthetic, political, and ethical implications of design, and will consider the global context of architecture in light of climate change and emerging building and design technologies. Successful students will gain skills in reading and discussing theoretical texts and will be able to better articulate their own critical thinking and positioning in the field. A passing grade in ARCH 5120 must be earned before enrolling in ARCH 6110.

Fall

Prerequisite: ARCH 5120

1 Course Unit

**ARCH 6210 Visual Studies III**

The final course in the Visual Studies sequence integrates more dynamic modeling, texturing, and rendering applications to synthesize and propel work from the earlier semesters. To avoid tropes and the inherent biases of the tools, the courses serve to help comprehend not only the technical and aesthetic but also the theoretical and political implications of representation. The three-semester arc provides an understanding of contemporary drawing, modeling, and visualization techniques while also creating the necessary grounding in the historical context needed to position one's work. This allows the students to engage and critique larger discussions in the field as well as to shape and impact culture and the built environment.

Fall

Corequisite: ARCH 6010

0.5 Course Units

**ARCH 6310 D3: Details, Data, Delivery**

This course is focused on advanced subjects in the project delivery of buildings, subjects inclusive of Biogenic and Carbon Responsive Materials and Details, Environment, Resiliency, and Fossil Fuel Free Building Systems Integration, Advanced Fabrication, Robotic Manufacturing, and Building Labor, and Computational Workflows, Artificial Intelligence, and Simulating Building. Students study complex, integrated, and sustainably determined buildings seeking their systems based, technological, and labor-based innovations. Students engage in advanced research methods and forensic analysis of artifacts and primary source documents associated with the material detailing, fabrication, data-scaping, virtualizing, simulating, and workflow planning of building projects. Students organize the collection of firsthand/primary source information and interview members of the project delivery team. Identifying how, why, and to what end products and practices are deployed in the construction of innovative projects is the goal.

Fall

0.5 Course Units

**ARCH 6330 Environmental Systems I**

The course prepares the students to understand the role of environmental systems in building design, and how to apply principles of building science such as the building heat balance, solar heat gain and daylighting in the early building design, through calculations and simulations. Issues of climate, health and environmental sustainability are explored as they relate to architecture in its natural context. The classes include lectures, site visits and lab sessions.

Spring

Corequisite: ARCH 6999

0.5 Course Units

**ARCH 6340 Environmental Systems II**

The second course in the Environmental Systems sequence considers the environmental and global systems of larger, more complex buildings. Contemporary buildings are characterized by the use of systems such as ventilation, heating, cooling, dehumidification, lighting, acoustics, and controls that not only have their own demands, but interact dynamically with one another. At a global scale, factors that connect the built environment to carbon emissions are explored, developing careful and rigorous analysis techniques to minimize both lifecycle and operational carbon emissions of buildings. As more buildings over the coming decades become all-electric, frontiers and opportunities for novel system design are explored.

Spring

Corequisite: ARCH 6999

.5 Course Units

**ARCH 6360 Material Formations**

Architectural design involves the incorporation of numerous technical and creative considerations that must be weighted and synthesized, and ultimately embodied in an architectural work's material outcome. The effectiveness of this endeavor is tightly related to a design's alignment with design-engineering, material and production constraints and opportunities. The building industry is increasingly adopting automated methods both in design and engineering software, and robotic means of fabrication and construction to decrease material, environmental and time costs. The discipline of architecture must not only keep pace with these developments, but also develop a creative and critical approach to the increasingly automated means by which buildings are designed and realized, re-casting it as an opportunity to engage in design with greater degrees of holistic thinking, while engaging in material and production decisions.

Spring

1 Course Unit

**ARCH 6710 Professional Practice I**

The Professional Practice Sequence comprises two essential courses: ARCH 6710 in the Spring of the second year and ARCH 7710 in the Fall of the third year. These courses play a pivotal role in integrating the student's design, history and theory, and technical expertise into the broader framework of the regulatory, business, and cultural realms they will encounter in their professional journey. The discipline of architecture demands an inquisitive mind capable of synthesizing a multitude of technical, aesthetic, social, and conceptual elements. This essential characteristic is not limited to the mere creation of built spaces; it also extends to formulating a process of labor that is both responsible and fair, and capable of adapting to the ever-changing conditions of the world. ARCH 6710 begins by briefly outlining the overall course sequence in order to locate the first section in the context of the next course in the Fall, ARCH 7710. From there the course uses each week to describe the methods involved in acquiring, designing, and constructing a building project. Lectures will delve deep into the mechanisms for articulating a design vision visually and verbally and the systems employed to ensure successful implementation of that vision. The lectures will draw connections between the student's studio design knowledge to date and the instructor's experience in practice including local building examples and current events. Due to the more limited time allotted per class for ARCH 6710, the course will be predominantly in-class lectures and out of class assignments.

Spring

0.5 Course Units

**ARCH 6741 Curricular Practical Training: Academic Year**

**Course Description** This course provides international Architecture department students the opportunity for practical training in architecture in the United States (CPT). The course develops critical thinking about the organization, operation, and ethics of professional practice in city planning. This course will allow international M.Arch/MSD students to work in an internship in the United States during the academic year without shortening their limited OPT time. The course is offered for .20 course units. The employment must relate to the major and the experience must be part of the program of study. Course enrollment is by permit only.

0.2 Course Units



**ARCH 6850 Environmental Readings**

In this seminar, we will explore the green thread in America thought and letters and analyze its influence on how we shape our environments through design and planning. The course has three parts. Throughout, the influence of literature on design and planning theory will be explored. The first part will focus on three most important theorists in environmental planning and landscape architecture: Frederick Law Olmsted Sr., Charles Eliot, and Ian McHarg. The second part of the course will critically explore current theories in environmental planning and landscape architecture. The topics include: frameworks for cultural landscape studies, the future of the vernacular, ecological design and planning, sustainable and regenerative design, the languages of landscapes, and evolving views of landscape aesthetics and ethics. In the third part of the course, students will build on the readings to develop their own theory for ecological planning or, alternatively, landscape architecture. While literacy and inquiry are addressed throughout the course, critical thinking is especially important for this final section.

Fall

Also Offered As: CPLN 6850, LARP 6850

1 Course Unit

**ARCH 6980 Architectural Association (AA), London**

This course is reserved for M.Arch students in their final year participating in the semester abroad program in London, England. The program is housed at the Architectural Association (AA), located on Bedford Square in the heart of Bloomsbury. Students enroll in a special section of ARCH 7040 taught by Penn faculty in London and in elective courses offered by the faculty at the AA.

Fall

1 Course Unit

**ARCH 6999 Second Year Technology Lab**

ARCH 6999 is a required lab/workshop that accompanies the core technology sequence in the M.Arch program in both the Fall and Spring terms. This non-graded lab section will offer additional instruction, workshops, lab time, and other support to the second year technology courses. Enrollment in ARCH 6999 is required for all Master of Architecture students taking ARCH 6330 and ARCH 6340.

0 Course Units

**ARCH 7010 Design Studio V**

The fall Advanced Design Studio focuses on the dynamic transformations shaping the 21st-century city. These transformations are multi-faceted, deep-rooted, and impact all aspects of contemporary urban life. Studio topics encompass a wide range of themes, including technological innovations, sociopolitical and environmental challenges, and cultural and historical shifts that typify architecture in the urban realm today. All studios travel to domestic and international cities to engage local stakeholders and conduct research on site. Successful completion of ARCH 6020 is a prerequisite for enrolling in ARCH 7010.

Fall

Prerequisite: ARCH 6020

2 Course Units

**ARCH 7030 Advanced Architectural Design Studio**

An Advanced Architectural Design Studio specifically tailored to post-professional students. Through this studio, students engage in the challenges and opportunities presented by changes in society, technology, and urban experience. Through design projects, they explore alternative modes and markets for practice, along with new directions and new tools for design.

Fall

2 Course Units

**ARCH 7040 Design Studio VI**

The sixth and final Design Studios offer an in-depth examination and exploration of relevant architectural subjects through critical conceptual thinking, rigorous research, and advanced design and representational methodologies. As the final studios in the M. Arch sequence, these studios lead inquiries into topical subjects and prepare students for lifelong engagement in the field. Studios are taught by leading practitioners in the field, who share their expertise with the students and equip them with the necessary tools to participate in the discipline at the highest level. All studios include travel to a domestic or international destination. Successful completion of ARCH 6020 is a prerequisite for enrolling in ARCH 7040.

Spring

Prerequisite: ARCH 6020

2 Course Units

**ARCH 7050 MSD-AAD Design Research Studio**

Students learn from industry leaders by electing their Design research Studio. The second semester design research studio focuses on large scale detail leading to a building design.

2 Course Units

**ARCH 7060 Honors Thesis Program**

The thesis program is offered to a select group of students who apply and qualify through two rounds of assessment, comprising typically 6-10 students. The summer and fall semester serve to develop research of interests individual to students, with the help of faculty advisors, who critique individually and as a group in a workshop format. Design projects are developed in the spring semester. Besides final reviews, students are expected to document their work in a book format.

Spring

2 Course Units

**ARCH 7070 AAD Fabrication Studio**

The final studio course in the MSD-AAD sequence. Through this studio, students engage in the challenges and opportunities presented by changes in society, technology, and urban experience. Through design projects, they explore alternative modes and markets for practice, along with new directions and new tools for design.

Summer Term

2 Course Units

**ARCH 7080 Bioclimatic Design Studio**

An advanced design studio for the MSD-EBD program that synthesizes the concepts and techniques of environmental building design. Topics and materials for the studio are developed in ARCH 7520: EBD Research Seminar, and summarized in a research report at the end of studio.

Summer Term

Prerequisite: ARCH 7510 AND ARCH 7520 AND ARCH 7530

2 Course Units

**ARCH 7090 Environmental Building Design Research Project**

Architecture is a process of discovery, of deciding what to work on, before it ever becomes a matter of design (disegno, drawing). For environmental building design, the process of discovery is even more profound, involving issues of resource consumption, modes of living and working, and of ecological interconnection that have to be explored before questions of performance can even be addressed. This design studio uses research at multiple scales to identify the topic of the studio, then student teams develop design for buildings of maximum (ecological) power.

Spring

Prerequisite: ARCH 7080 AND ARCH 7510 AND ARCH 7520 AND ARCH 7530

2 Course Units

**ARCH 7100 Contemporary Theory 1989-Present**

A chronological overview of the approaches and attitudes adopted by architects, theorists and inter-disciplinary writers from 1993- today that have helped shape the current discourse of architecture. This course will introduce and contextualize key projects, and polemics over the last 25 years. Central themes in this course include the impact of digital technologies and methods of design, production and materiality. These are explored through texts, movements, projects and buildings that help form an overview that has shaped the contemporary condition that we live in. There have been a myriad of different approaches and through a select set of readings and lectures students will be exposed to crucial texts, projects and buildings making students versatile and knowledgeable in the important concepts that shape our current discourse. A focus will be the organization, configuration and articulation of buildings and the conceptual and cultural arguments they are associated. Formal, organizational and material characteristics of this period will be explored. This class will develop students' knowledge and provide a platform from which they can continue the discussions surrounding architectural thought and practice. The students will learn to communicate their ideas verbally and in writing. Contemporary topics in architecture theory and projects are introduced in a weekly lecture format critical to the shaping of our discipline today. A weekly recitation session allows students to engage with the readings critically in the subject matter. A mid-term and final paper are required to pass this class. (Topics to be covered: Seminal projects and buildings in the last 25 years, situating the architects work within a culture of debate and discourse identifying the important readings surrounding each building/project.) This course is a requirement of the MSD-AAD curriculum.

Spring

1 Course Unit

**ARCH 7110 Topics in Architecture Theory I**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

Fall

1 Course Unit

**ARCH 7111 Topics in Architecture Theory I**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

Fall

1 Course Unit

**ARCH 7112 Topics in Architecture Theory I**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

Fall

1 Course Unit

**ARCH 7113 Topics in Architecture Theory I**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

Fall

1 Course Unit

**ARCH 7114 Topics in Architecture Theory I**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

Fall

1 Course Unit

**ARCH 7115 Topics in Architecture Theory I**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

Fall

1 Course Unit

**ARCH 7120 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

Spring

1 Course Unit

**ARCH 7121 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7122 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7123 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7124 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7125 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7126 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7127 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7128 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7129 Topics in Architecture Theory II**

A seminar on advanced topics in architectural design and theory. Topics and instructors will vary.

1 Course Unit

**ARCH 7130 Ecological Thinking in Art and Architecture**

This seminar will address the diverse narratives of ecological thinking in the history of art, architecture, and urban planning during the 20th century. The course will contextualize and interrogate contemporary disciplinary discourses as well as historical assumptions related to ecological thinking in art and architectural history and environmentally-conscious practices. By mapping received trajectories of Eco Art, Ecocritical Art History, and Ecological Histories of Architecture and Urban Planning, the course will work from a subtly hidden foundation of eco-historical knowledge that connects these fields of inquiry, while also critiquing these trajectories and seeking to provide more focused and robust alternatives for knowledge production in the present. It aims to attract students from the School of Arts and Sciences and the Weitzman School of Design in a discussion on the interconnected histories of art and architecture during the 20th century.

Also Offered As: ARTH 5770

1 Course Unit

**ARCH 7140 Museum as Site: Critique, Intervention and Production**

In this course, we will take the museum as a site for critique, invention, and production. As architecture, cultural institution, and site of performance, the museum offers many relevant opportunities. Students will visit, analyze, and discuss a number of local exhibitions and produce their own intervention in individual or group projects. Exhibition design, design of museum, the process of curating, producing artworks ranging from paintings to installation and performance, as well as attention to conservation, installation, museum education, and the logistics and economics of exhibitions will be discussed on site and in seminar. These topics and others will be open for students to engage as part of their own creative work produced for the class and an online exhibition.

Spring

1 Course Unit

**ARCH 7150 Contemporary Aesthetic Theory**

This weekly lecture course examines the field of aesthetics and its relationship to architecture in the broader context of contemporary social and cultural conditions. Aesthetics are often sidelined in architectural discussions as dealing with mere surface, style, or subjective notions of beauty. By contrast, this course will center aesthetics as a discourse that is deeply enmeshed in material, political, and cultural histories. The course will present a number of critical approaches to aesthetics, and will explore different contemporary ideas around the transformative potentials of aesthetics as a form of sensorial and cultural practice.

In discussions on readings and visual case studies, students will explore aesthetics in relation to contemporary issues that include digital representation, artificial intelligence, the Anthropocene, the nonhuman, class, gender, and race, and the post-colonial.

1 Course Unit

**ARCH 7180 History and Theory of Architecture and Climate: Challenges and Opportunities for the 21st Century**

This history and theory seminar aims to equip students with a multifaceted understanding of key challenges and opportunities in designing climate-sensitive architecture in the 21st century, in view of the instabilities brought about by climate change and other human-inflicted disruptions to our planet's ecosystems. It demonstrates how creative design ideas and applications can arise from cross-cultural pollination. To do so, the lectures, readings and student research draw on both vernacular buildings and authored case studies and theories in an array of contexts, diverse cultures living within a range of climates on all continents. The seminar's theoretical premise is that architecture and climate have always affected one-another, even if the awareness of architecture's effects on climate change is recent. The seminar therefore focuses on architect's role within a design team as one that assesses and integrates quantifiable parameters for climatic performance through a qualitative socio-cultural lens. The seminar's method is topical rather than historical. Each topic is presented from several facets, often with diverging views and motives. Each class is divided into a topical lecture and a students' presentation and discussion of the characteristics of one climate region and its architectural challenges. In preparation of discussions students read and write critical responses. As a term project, students research and compare case studies, and present them graphically and verbally. The seminar is open to all graduate architecture students. The course is a core requirement for the MSD-EBD degree.

Spring

1 Course Unit

**ARCH 7190 The Neo-Avant Garde of the 1960's and 70's: Cohorts and Ongoing Legacies**

The 1960's and 70's saw the emergence of a number of counter-cultural groups across the world which challenged modernist universalist concepts. Most of these groups were young and iconoclastic, presenting their ideas as visionary statements, well outside the constraints of built architecture, which were identified with the problematized "establishment" architecture officially sanctioned by the academies and professional publications. Most of these groups were short-lived, but their radically charged ideas continue to influence ideation to the present day, in work which moved from rhetorical statement to built fact. Theirs was an architecture of resistance, an architecture positioned against the status quo, an architecture of renewal which embraced complexities of references, inspirations, and ambitions. This seminar covers the early manifestos and projects through the work and ideas of the latter day. The original groups and individuals to be addressed: (1) Archigram and Cedric Price (UK), (2) the Situationists, Utopie and Yona Friedman (France), (3) Soleri/Arcosanti, Ant Farm, Drop City and Ambasz (US), (4) Hans Hollein and Hans-Rucker-Co (Austria), and (5) Metabolism (Japan). Tying the work of the era through a series of topical themes entails the construction of a network of influences, story lines, hermeneutics--latter-day reappearances of vestigial sources, phantoms of radicalisms past. Through a series of readings, presentations and discussions, we will weave these together, addressing concepts of the utopian and the visionary, radical ecologies as environmentalism emerged in the sensibility of the era, megastructures built and unbuilt, how architecture was influenced by the sciences of communication, biology and information, how science fiction entered into architecture, how ideas of housing evolved from megastructures into dwelling of soft membranes and finally, ideas of event and happening in 1960's theater and performance art, then and now. Coming into the present day, these groups prophesied, to an uncanny degree, many facets present in contemporary architecture, from to the impact of technology in general on the architectural project, to the active exploration of early environmental hybridities, to immersive and responsive environments, to the challenge of material tangibility by virtual realms, and simultaneously, the introduction of new types of organic and plastic materials."

Fall

1 Course Unit

**ARCH 7200 Visual Literacy and its Culture**

The digital turn in the creative fields resulted in profound transformations of techniques, aesthetics and underlying concepts in the development of contemporary visual culture. The dissemination and consumption of information through images through all types of media platforms influence and re-define (for better or worse) all aspects of our culture and reality. It is vital to develop a deep knowledge of the current visual concepts and techniques in arts, photography, cinema, product design and architecture to claim a critical stance through which we can positively contribute to the evolution of contemporary culture. The discipline of architecture has been deeply influenced by the digital shift in modes of design and visualization which yielded a wide array of directions within the architectural discourse, especially with questions and problems regarding representation. One clear outcome of this transformational period is the diversity of new representational strategies to seek alternative modes of visualization. It is clear that no one representational medium can be defined as the locus of architectural thought and architecture, as a cultural practice, can no longer be defined through the output of a single medium. The reality of our discipline is that we work through collective mediums and conventions of drawings, models, images, simulations, texts, prototypes and buildings to visualize architectural concepts. These mediums all require degrees of expertise in techniques that are necessary for their execution: they all involve conceptual depth that define their disciplinary positions; they all require translations across each other to enable subjective work-flows; they all require aesthetic attitudes to influence the development of visual culture in architecture. This course will introduce the AAD majors to contemporary topics of visualization in arts, photography, cinema and architecture. They will explore multiple mediums of representation to help them gain the vital visual literacy to excel in the program. Students will be introduced to discursive background and contemporary concepts of line drawing, fabricated object and constructed image as they work through 3 distinct projects during the semester. Each exercise will be initiated by a topical lecture and be followed by weekly pin ups to advance student projects. (Topics to be covered: Discourse of Contemporary Line Drawing, Multi-part 3D Printing, Vacuform/CNC Milling, Digital/Analog Surface Articulation, Rendering, Abstraction and Realism, Montage/Collage/Photorealism)

Spring

1 Course Unit

**ARCH 7210 Designing Smart Objects for Play and Learning**

Today's children enjoy a wide array of play experiences, with stories, learning, characters and games that exist as physical stand-alone objects or toys enhanced with electronics or software. In this course, students will explore the domain of play and learning in order to develop original proposals for new product experiences that are at once tangible, immersive and dynamic. They will conduct research into education and psychology while also gaining hands-on exposure to new product manifestations in a variety of forms, both physical and digital. Students will be challenged to work in teams to explore concepts, share research and build prototypes of their experiences in the form of static objects that may have accompanying electronic devices or software. Final design proposals will consider future distribution models for product experiences such as 3D printing, virtual reality and software- hardware integration. Instruction will be part seminar and part workshop, providing research guidance and encouraging connections will subject matter experts throughout the Penn campus.

Fall

Also Offered As: IPD 5210

1 Course Unit

**ARCH 7220 Vibrant Artifacts**

As we move into an age of environmental consciousness and the nature-architecture dichotomy dissolves in favor of emerging ideologies of interconnectedness, it may no longer be appropriate to perpetuate the notion that our buildings are impervious and separate to the environments in which they are sited. Through the design of prototypical details cumulating in a spatial object, students will speculate on conditions of permissible weathering, degradation and inhabitation of our artifacts by non-human entities. In support of this task, students will learn the surrounding theoretical context by studying key texts from Ruskin, Mostafavi and Leatherbarrow, Kallipoliti, Morton and Bennet that focus on the topics of weathering, ruination and contemporary ecological ideas; where and why these various effects occur in the built environment at present; and procedural design, modelling workflows in Houdini FX that integrate computational intelligence through weather simulation and geometric analysis.

1 Course Unit

**ARCH 7240 Technology in Design**

The aim of this course is to understand the new medium of architecture within the format of a research seminar. The subject matter of new media is to be examined and placed in a disciplinary trajectory of building design and construction technology that adapts to material and digital discoveries. We will also build prototype with the new media, and establish a disciplinary knowledge for ourselves. The seminar is interested in testing the architecture-machine relationship, moving away from architecture that looks like machines into architecture that behaves like machines: An intelligence (based on the conceptual premise of a project and in the design of a system), as part of a process (related to the generative realm of architecture) and as the object itself and its embedded intelligence.

Spring

1 Course Unit

**ARCH 7250 Design Thinking**

Creating new product concepts was once a specialized pursuit exclusively performed by design professionals in isolation from the rest of an organization. Today's products are developed in a holistic process involving a collaboration among many disciplines. Design thinking - incorporating processes, approaches, and working methods from traditional designers' toolkits - has become a way of generating innovative ideas to challenging problems and refining those ideas. Rapid prototyping techniques, affordable and accessible prototyping platforms, and an iterative mindset have enabled people to more reliably translate those ideas into implementable solutions. In this course, students will be exposed to these techniques and learn how to engage in a human-centered design process.

Fall

Also Offered As: IPD 5720

1 Course Unit

**ARCH 7260 Furniture Design Strategic Process**

Like architecture, furniture exists at the intersection of idea and physical form. Due to the specific scale that furniture occupies, however, this physical form relates not only to the environment in which the furniture is set, but also intimately to the physical bodies that interact with and around it. Additionally, as a manufactured product, often specified in large quantities, furniture must also address not only poetic considerations, but practical and economic ones as well. Instead of being seen as one-off objects, the furniture created in this seminar focuses on furniture development as a strategic design process where the designer's role is to understand the various responsibilities to each stakeholder (client/manufacturer, market/customer, environment) and the additional considerations (materials, processes, manufacturability, etc.), and ultimately translate these points into a potentially successful product. In order to approach furniture in this manner, the course will be structured around specific design briefs and clustered into three distinct but continuous stages. First, through focused research into stakeholder needs and potential market opportunities, students will craft tailored design proposals and development concepts accordingly. Next, students will work toward visualizing a concept, complete with sketches, small mock-ups, scale-model prototypes, technical drawings, connections and other pertinent details in order to refine their proposals and secure a real world understanding of the manufacturing processes and the potential obstacles created by their decisions. From insights gained and feedback from these steps, students will ultimately develop a final design proposal for a piece, collection, or system of furniture that successfully leverages their understanding of a thoughtful and deliberate design strategy.

Spring

1 Course Unit

**ARCH 7280 Design of Contemporary Products: Design for Equity, Inclusion and Accessibility**

The power of design to shape the world we live in is increasingly obvious, as is the responsibility of designers to challenge our assumptions about who designs, who is included or marginalized by our designs, and how we can make sure that all design is inclusive design. This course will address issues around designing for equity, inclusion and accessibility and co-design. We will ask, What is inclusive design? Who does it serve? What should it look like? To answer these questions, we will engage with the current discourse around designing for equity, inclusion and accessibility, with a particular focus on accessibility. We will engage with disability justice frameworks and critical disability studies to challenge our assumptions about disability and engagement. And we will connect with members of the disability community and co-design along with them. This course is intended for anyone who considers themselves a designer: of physical or digital products, places, or services who wants to prioritize inclusion in their practice

Spring

Also Offered As: IPD 5280

1 Course Unit



**ARCH 7300 Techniques, Morphology, and Detailing**

The course will focus on design, morphology detailing, and the construction of a pavilion on a chosen site. The course will develop through hands-on workshops and will focus on acquiring knowledge through making, (Techne), understanding the morphological transformation of a given geometric packing, and building using readily available materials. The process consists of building and testing physical models that simulate the actual pavilion in order to ultimately realize the desired design. The second half of the semester will focus on using lightweight construction materials to fabricate the pavilion's actual components, including structural elements, molded components, and joints, which are required for the pavilion's final assembly. Additionally, students will learn to organize design and fabrication teams, control design and production schedules, and work with a set budget, which requires keeping track of construction costs and forecasting required procurements, including material quantities takeoff, ordering materials and scheduling deliveries.

Spring

1 Course Unit

**ARCH 7310 Experiments in Structures**

This course studies the relationships between geometric space and those structural systems that amplify tension. Experiments using the hand (touch and force) in coordination with the eye (sight and geometry) will be done during the construction and observation of physical models. Verbal, mathematical and computer models are secondary to the reality of the physical model. However these models will be used to give dimension and document the experiments. Team reports will serve as interim and final examinations. In typology, masonry structures in compression (e.g., vault and dome) correlate with "Classical" space, and steel or reinforced concrete structures in flexure (e.g., frame, slab and column) with "Modernist" space. We seek the spatial correlates to tensile systems of both textiles (woven or braided fabrics where both warp and weft are tensile), and baskets (where the warp is tensile and the weft is compressive). In addition to the experiments, we will examine Le Ricolais' structural models held by the Architectural Archives.

Fall

1 Course Unit

**ARCH 7320 Technology Designated Elective**

Several sections are offered from which students make a selection.

Spring

1 Course Unit

**ARCH 7321 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

1 Course Unit

**ARCH 7322 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

1 Course Unit

**ARCH 7323 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

1 Course Unit

**ARCH 7324 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

1 Course Unit

**ARCH 7325 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

1 Course Unit

**ARCH 7326 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

1 Course Unit

**ARCH 7327 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

1 Course Unit

**ARCH 7328 Technology Designated Elective**

Several sections are offered from which students make a selection.  
1 Course Unit

**ARCH 7329 Technology Designated Elective**

Several sections are offered from which students make a selection.  
1 Course Unit

**ARCH 7330 New Materials and Methods**

There is today a renewed interest in materiality and materialization in architecture that is fueled by rapidly advancing fields in materials engineering combined with newly available cutting-edge digital design and fabrication environments. This MSD AAD required course helps students formulate a robust research proposal for their culminating design studio in large-scale robotic manufacturing using new materials. The course provides a forum for critical discussion of contemporary design practices that is exploratory and speculative in nature. In addition to collaborative thinking and debate, student groups will develop their own research interests to formulate contemporary positions through the research of materials, fabrication methods, and their application in experimental architectural design projects.

Fall

1 Course Unit

**ARCH 7340 Ecological Architecture - Contemporary Practices**

Architecture is an inherently exploitive act - we take resources from the earth and produce waste and pollution when we construct and operate buildings. As global citizens, we have an ethical responsibility to minimize these negative impacts. As creative professionals, however, we have a unique ability to go farther than simply being "less bad." We are learning to design in ways that can help heal the damage and regenerate our environment. This course explores these evolving approaches to design - from neo-indigenous to eco-tech to LEED to biomimicry to living buildings. Taught by a practicing architect with many years of experience designing green buildings, the course also features guest lecturers from complementary fields - landscape architects, hydrologists, recycling contractors and materials specialists. Coursework includes in-class discussion, short essays and longer research projects.

Spring

1 Course Unit

**ARCH 7360 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

Spring

0.5 Course Units

**ARCH 7361 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

0.5 Course Units

**ARCH 7362 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

0.5 Course Units

**ARCH 7363 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

0.5 Course Units

**ARCH 7364 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

0.5 Course Units

**ARCH 7365 Technology Designated Elective**

Technology Designated Electives enable students to deepen their understanding of architectural issues, and M.Arch students must complete 1 CU of any ARCH 732x and/or ARCH 736x course(s). But these courses are not limited to students in the department of architecture any graduate student at Weitzman is invited to register for a Technology Designated Elective of interest, space permitting. Topics vary between semesters, and specific details can be found in the "Section Details" area in course search.

0.5 Course Units

**ARCH 7370 Semi-Fictitious Realms: A History and Future of Virtual Reality**

The pursuit of immersive digital experiences has long been a goal of the computing industry. Early wearable displays designed in the 1960s depicted simple three-dimensional graphics in ways that had never been seen before. Through trial and error, digital pioneers reframed the relationship between user and machine, and over the last five decades, have made strides that advanced both the input and output mechanisms we are so comfortable with today. As a field, architecture has been reliant on these advancements to design and document buildings, but these tools still leave the architect removed from the physicality of the design, with their work depicted as 2D lines or 3D planes alone. This course will study the evolutionary advancements made that now allow us to fully inhabit digital worlds through Virtual Reality. Using the Unity Video Game Engine, students will generate immersive, photo-realistic models of unbuilt architectural works and explore digital/physical interactivity. These models will be designed to have compatibility with both 6-DOF and 3-DOF Virtual Reality equipment as well as flythrough-style experiences for keyboard and mouse using various web-hosting platforms. From the terraces of Paul Rudolph's Lower Manhattan Expressway to Boullée's Cenotaph for Newton, the goal of this course is to breathe new life into places and spaces that have, until this time, never been built or occupied.

Fall  
1 Course Unit

**ARCH 7371 Remixed Realities**

This course will introduce students to workflows for authoring VR content in the Unity 3D Video Game Engine, teach them skills in developing custom interactions with the C# coding language, and challenge them to create speculative mixed reality scenarios. Students will explore several forms of mixed reality in a series of exercises leading up to a final narrative-based VR experience. We will speculate on the occupation of physical/digital hybrids by using a calibration routine to align digital geometry to physical spaces in VR; create volumetric documentary experiences using reality capture techniques to record existing spaces and objects; and develop rich VR experiences using remixed volumetrically captured geometry, digital geometry, and physical spaces.

1 Course Unit

**ARCH 7380 The Modern House: Technology Then and Now**

In the current age of new fabrication methodologies, methods are emerging for the conception and design of the contemporary house which have radical potential for enclosure, habitation and practices of daily life. This course begins by examining the canonical houses of the original avant-garde -Adolf Loos, Frank Lloyd Wright, Le Corbusier, Mies van der Rohe and Alvar Aalto -on the premise that their houses were working manifestos for rethinking space, form and indeed ideas of life itself -all of which were prompted by new concepts of construction. From this spectrum of issues, contemporary houses and contemporary methods and materials will be studied extensively to develop equally new ideas between matter and quotidian life. As the primary task of the course, students will work in teams to develop highly detailed constructional proposals for a portion of a speculative home.

Spring

1 Course Unit

**ARCH 7390 New Approaches to an Architecture of Health**

Health care is taking on a new role in our society - with a refocusing from episodic care for those who are ill or symptomatic to providing life-long care geared towards maintaining wellness. These changes are evident across numerous areas of design, from wearable technologies that track and analyze, to large scale building initiatives that aim to create healthier environments and improve lives through strategic planning initiatives. A concrete, physical representation of this paradigm shift can be found within the hospital building itself and in the new manner in which hospitals are looking to serve their patients and care for their clinicians. Simultaneously both public and private spaces, hospitals are complex systems in which sickness, health, hospitality, technology, emergency, and community share space and compete for resource. In order to frame our present day understanding of the role of architecture (and design) in fostering health for individuals and within communities, this seminar will begin with an exploration of the historical and contemporary perspectives on the role of the architect and built environment on health. (Parallels between design and our ever-changing understanding of the biological, social, and environmental causes of sickness and disease will also be explored.) During this conversation, students will read articles and study recently constructed projects in order to examine the ways in which the architects approached these topics through built form. Following from this foundation, students will craft arguments for a new approach to the individual, the community, health, and architecture through a written response and architecturally designed scenario that argues for their perspective on how architecture can and should shape the health of those who inhabit it. Throughout the course, students will engage in weekly readings (and discussions) of critical texts exploring ideas around the role and impact of architecture on health. Various content experts will be included in the course to provide additional insights into key areas of theory and practice in order to lend additional perspectives and ground the conversation.

Fall

1 Course Unit

**ARCH 7410 Architecture Design Innovation**

The mastery of techniques, whether in design, production or both, does not necessarily yield great architecture. As we all know, the most advanced techniques can still yield average designs. Architects are becoming increasingly adept at producing complexity & integrating digital design and fabrication techniques into their design process - yet there are few truly elegant projects. Only certain projects that are sophisticated at the level of technique achieve elegance. This seminar explores some of the instances in which designers are able to move beyond technique, by commanding them to such a degree as to achieve elegant aesthetics within the formal development of projects.

Fall

1 Course Unit

**ARCH 7420 Function of Fashion in Architecture**

The Function of Fashion in Architecture will survey the history of fashion and the architectural parallels starting from Ancient Civilization to Present. The focus will be on the relevance of garment design, methods and techniques and their potential to redefine current architecture elements such as envelope, structure, seams, tectonics and details. The functional, tectonic and structural properties of garment design will be explored as generative platforms to conceptualize very specific architectural elements. One of the challenges in the course is the re-invention of a means of assessment, the development of notations and techniques that will document the forces and the production of difference in the spatial manifestations of the generative systems.

Spring

1 Course Unit

**ARCH 7430 Form and Algorithm**

The critical parameter will be to develop the potential beyond finite forms of explicit and parametric modeling towards non-linear algorithmic processes. We will seek novel patterns of organization, structure, and articulation as architectural expressions within the emergent properties of feedback loops and rule-based systems. This seminar will accommodate both introductory and advanced levels. No previous scripting experience is necessary. It will consist of a series of introductory sessions, obligatory intensive workshops, lectures followed by suggested readings, and will gradually focus on individual projects. Students will be encouraged to investigate the limits of algorithmic design both theoretically and in practice through a scripting environment.

Fall

1 Course Unit

**ARCH 7440 Image, Object, Architecture**

As we have entered a postdigital era, the dominance of a purely technological approach as a vehicle for design innovation has waned. Questions of substance and disciplinary autonomy have found their way back into the contemporary cultural discourse, enriching the way we examine and deploy advanced technologies towards novel expressions in architecture. This seminar will investigate, through the production of estranged objects, opportunities for design that are being generated at the intersection of machinic and human minds, and speculate on possible futures in which concepts of nature and technology have been inseparably intertwined.

Spring

Also Offered As: IPD 5440

1 Course Unit

**ARCH 7460 Cinema and Architecture in Translation**

Cinema and Architecture in Translation is a seminar that will survey key cinematic moments and techniques within the history of film and find new intersections between architecture and narratives. The focus will be on the relevance of mise-en-scene, the background and building figures of architecture and future speculations of the city, yet in relation to narrative dynamics. One of the challenges is to consider techniques that will affect both conceptualization and the production of spatial manifestations using potent visual platforms. Current pre and post-production techniques in film making methods are converging with architectural digital representation. This is an opportunity that provides fertile ground for architects to re-examine the 'digital' in a variety of scales in relation to impactful narratives and visualizations. These tools, specifically the technique of "matte-painting" will be explored in this course. There is a rich history in constructing images, speculative worlds and scenes for the film industry. We will explore the parallels between the tools and strategies of cinematic visualization as it relates to advanced architectural image making. Students will have the opportunity to analyze filmic scene making, learn advanced representation and techniques in matte painting and zbrush. Above all this course will engage students in the conceptual as well as practical complementarities of architecture and cinema, while watching some of the best films ever made and the most provocative and insightful books to help process them. An important aspect of this course will be to explore the differences between "real" architecture and the cinematic architecture. The expansive Space and Time in which cinematic architecture is located, creates an incubator where true innovated speculation can occur. This is an advanced representation course that produces 2D images and narrative texts.

Spring

1 Course Unit

**ARCH 7470 Robotic Fabrication**

Automation and robotics have helped manufacturing increase productivity by 1,500% since 1945 (McKinsey 2017). In contrast, however, construction productivity has remained relatively stagnant during the same time. The construction industry is facing pressure to change. For the robotics industry, construction presents potential use cases and unique applications that can utilize a variety of evolving technologies from drones, ground robotics, teleoperation, machine vision, additive manufacturing, and assistive robotics. These technologies take advantage of the digital revolution and utilize ideas in automobile and aerospace engineering. Our interest in these technologies is that they open new opportunities for design. Robotic fabrication will explore the theory and design of a project that will form a component of the culminating design studio for the MSD AAD program. Theory will be explored through a series of lectures and the design component will focus on a one to one scale fabrication of a project determined by the design studio curriculum.

Summer Term

1 Course Unit

**ARCH 7480 Architecture and the New Elegance**

This design seminar will define and elaborate on the following topics for the digital discourse - the contemporary diagram, technique, structural thinking, systemic thinking and aesthetic projections. Technological innovations establish new status quos and updated platforms from which to operate and launch further innovations. Design research practices continually reinvent themselves and the techniques they use to stay ahead of such developments. Reinvention can come through techniques that have already been set in motion. Mastery of techniques remains important and underpins the use of digital technologies in the design and manufacturing of elegant buildings. But, ultimately, a highly sophisticated formal language propels aesthetics. The repositioning of design intent and the complex order generated by the behavioral techniques of multi-agent systems has implications for the affects which are generated as well as the nature of hierarchy within architecture. The distributed non-linear operation of swarm systems intrinsically resists the discrete articulation of hierarchies within Modern architecture and contemporary parametric component logic. The bottom-up nature of swarm systems refocuses tectonic concerns on the assemblage at the micro scale rather than the sequential subdivision of program or form. The seminar will explore strategies for high population agent models through the use of lightweight algorithmic environments, in particular the Java-based platform Processing.

Spring

1 Course Unit



**ARCH 7490 Indeterminate Delineations**

Architecture has always been closely entangled with modes of vision. Devices ranging from Durer's perspective machine to the photographic eye have strongly shaped the way we think and design the built environment of our cities. A strange loop is in place here: our world-views provide the development of specific modes of representation, of engagement with the world, and in turn they begin to have an impact in that same world, becoming an active element in the way we understand it. Put more simply, it is the technologies through which we see and experience the built environment that define the way we construct it. In this class, we will focus on visual and physical points as anchors to tie modes of vision with modes of construction. Points play an important role in the history of visuality: if during Impressionism and Pointillism they were devised to delineate the contrast and alignments between what we see and how we see it in an attempt to investigate the mechanics of vision, it was during the post war period that Max Wertheimer's work at the Berlin School of Gestalt Psychology leveraged them as graphic elements to understand part to whole relationships central to Bauhaus' design pedagogy. Today, imaging technologies are once again placing points as central elements in the construction of our contemporary visual language, transforming ever-growing datasets of partial images in three dimensional machine readable survey models: it is with points and aggregated clouds that we are constructing the figure of our cities. As such, they become a necessary site of design investigation to move beyond monolithic views of the world. This class leverages the bi-product of scanning technologies - point clouds and image making - to explore inclusive modes of delineations: a visual sensibility to engage with the multifaceted nature of the built environment.

Fall

1 Course Unit

**ARCH 7500 Parafictional Objects**

This representation/design seminar explores the aesthetics of estrangement in realism through various mediums. The reality of the discipline is that architecture is a post-medium effort. Drawings, Renderings, Models, Prototypes, Computations, Simulations, Texts, and Buildings are all put forward by architects as a speculative proposal for the reality of the future. Students will explore the reconfiguration of a "found object" in multiple mediums and represent parafictional scenarios in various techniques of realism. At a time when rendering engines enable the production of hyper-realistic images within the discipline without any critical representational agenda, it has become ever more imperative to rigorously speculate on realism.

Spring

1 Course Unit

**ARCH 7510 Ecology, Technology, and Design**

This course will examine the ecological nature of design at a range of scales, from the most intimate aspects of product design to the largest infrastructures, from the use of water in bathroom to the flow of traffic on the highway. It is a first principle of ecological design that everything is connected, and that activities at one scale can have quite different effects at other scales, so the immediate goal of the course will be to identify useful and characteristic modes of analyzing the systematic, ecological nature of design work, from the concept of the ecological footprint to market share. The course will also draw on the history of and philosophy of technology to understand the particular intensity of contemporary society, which is now characterized by the powerful concept of the complex, self-regulating system. The system has become both the dominant mode of explanation and the first principle of design and organization. The course will also draw on the history and philosophy of technology to understand the particular intensity of contemporary society, which is now characterized by the powerful concept of the complex, self-regulating system. The system has become both the dominant mode of explanation and the first principle of design and organization.

Fall

1 Course Unit

**ARCH 7520 Fundamentals of Bioclimatic Design**

Directed student research of selected topics in environmental building design. These topics will be further explored in ARCH 7080: Bioclimatic Design Studio and will provide the basis for the research documents developed with each student's design project. Course work will include lectures, discussions, weekly readings, and in-class exercises. Each student will be required to make a presentation and submit a research report.

Fall

1 Course Unit

**ARCH 7530 Building Performance Simulation**

The course provides students with an understanding of building design simulation methods, hands-on experience in using computer simulation models, and exploration of the technologies, underlying principles, and potential applications of simulation tools in architecture. Classroom lecturers are given each week, with a series of analysis projects to provide students with hands-on experience using computer models. This course is required and reserved for MSD-EBD students.

Fall

1 Course Unit



**ARCH 7540 Performance Design Workshop**

The workshop applies simulation and diagramming techniques to a series of discrete design projects at different scales. The emphasis is on refinement and optimization of performance based building design. Performance analysis techniques can provide enormous amounts of information to support the design process, acting as feedback mechanisms for improved performance, but careful interpretation and implementation are required to achieve better buildings. Energy, lighting, and air flow are the three main domains covered in the workshop. Students will learn how to utilize domain tools at an advanced level, and utilize them as applications to examine the environmental performance of existing buildings. Using the results of analytical techniques, the students will develop high-performance design strategies in all three domains. Lectures will be given on specific topics each week. A series of analytical class exercises will be assigned to provide students with hands-on experience in using the computer models. A case-study building will be provided at the beginning of the course and students will model different components each week throughout the semester. Every week students present the progress of their work, which will be used to correct methodological and technical issues. Energy, lighting, and air flow are the three main domains covered in the workshop. Students will learn how to utilize domain tools at an advanced level, and utilize them as applications to examine the environmental performance of existing buildings. Using the results of analytical techniques, the students will develop high-performance design strategies in all three domains. Prerequisite: ARCH 7530 Lectures will be given on specific topics each week. A series of analytical class exercises will be assigned to provide students with hands-on experience in using the computer models. A case-study building will be provided at the beginning of the course and students will model different components each week throughout the semester. Every week students present the progress of their work, which will be used to correct methodological and technical issues.

Spring

Prerequisite: ARCH 7530

1 Course Unit

**ARCH 7550 Environmental Building Design Research Methods**

This course serves as preparation for a research project by students in the MSD-EBD or PhD programs. The students will learn how to develop, plan, and conduct experiments and will develop the tools to write research papers based on these experiments. During the semester, topical lectures and case-studies of novel work in architectural technology will be presented to the students by the instructor and guest lecturers. The research proposal developed during the course will be used as a basis for hands-on exercises in the lab portion.

Fall

2 Course Units

**ARCH 7560 Thermodynamic Systems and Methods**

This course focuses on the study of thermodynamic systems used in heating, ventilation, and air conditioning (HVAC) of buildings, and methods for their design, modeling, and analysis. Heat pumps are central to the use of many environmental heat sources and heat sinks, allowing buildings to more efficiently use low intensity environmental resources to keep buildings comfortable and healthy. Students will construct and use physical prototypes to understand the design and performance of heat-pumps based on the vapor compression cycle and will explore their use in a variety of innovative building applications. The course will use a range of modeling tools to explore thermodynamic potentials of environmental sources, validating the models with test data from the prototypes.

Fall

1 Course Unit

**ARCH 7580 Resilience: Project Energos, Nevada, Japan, Taiwan**

This seminar explores a broad range of topics around the subject of Resilience and Sustainability. We will use a green infrastructure property development currently under construction in real time as our focus, Project Energos, a massive green field site in Nevada by Los Angeles developer TerraScale. This research seminar will support a subsequent 700-level studio offering in Fall. Students are welcome to enroll in this seminar with or without taking the studio. The subject is relevant to all students interested in understanding how action is currently being taken in the United States through a global lens advancing a resilient agenda.

Spring

1 Course Unit

**ARCH 7610 Introduction to Real Estate Development for Architects**

The course introduces students to the participants and components to the development process, as well as specific development strategies and design tools for engaging them. Design in this sense is not simply a vision, or a concept utilized for obtaining approvals, it is understood as an encompassing set of procedures that both allow for and ensure that goals are being met at all stages of a project, from early conception through the approval process and building construction. Students will learn how to engage municipal land-use laws and regulations, produce strategies for geometric development based on land-use and environmental constraints, and use simulation to perform value-adding operations to a development proposal. Through lectures and exercises, students will have the opportunity to analyze a building and the redevelopment procedures surrounding it and develop a geometric response and then parse data from that model to drive a series of documents relating to project cost, funding, and schedule. These documents will be analyzed against a variety of construction means and funding models so time- and cost-effective basis that meets design intentions can be developed.

1 Course Unit

**ARCH 7620 Design and Development**

This course provides an overview of the real estate development business looked at in relationship to urban design, city planning, and architectural design. It provides exposure to the many real-world considerations of private sector development as well as an introduction to the language of real estate. The class focuses on various commercial building types and product offerings with examples of how planning, architectural and other design professions fit into creation of real estate value and the development process. This will cover the practical considerations and typical trade-offs of commercial business practices and real estate investment parameters and how these influence the ways developers and designers work. Industry sectors may include housing (single, multifamily and affordable), office, retail, hospitality, and industrial, with project types ranging from greenfield, adaptive reuse, downtown development, mixed-use projects, and planned communities. Through exercises, lectures and case studies, we'll address what drives the decisions designers and non-designers make in the development process, and provide insight to help designers understand what makes developers tick. Visiting lecturers (typically architects and developers) will provide real-world examples. Weekly written exercises, case studies and presentation assignments stress critical thinking, evaluating projects by how well they do their job and analyzing how that job is defined.

Spring

Also Offered As: CPLN 6430

1 Course Unit

**ARCH 7650 Project Management**

This course is an introduction to techniques and tools of managing the design and construction of large, and small, construction projects. Topics include project delivery systems, management tools, cost-control and budgeting systems, professional roles. Case studies serve to illustrate applications. Cost and schedule control systems are described. Case studies illustrate the application of techniques in the field.

Spring

1 Course Unit

**ARCH 7680 Real Estate Development**

This course evaluates "ground-up" development as well as re-hab, re-development, and acquisition investments. We examine raw and developed land and the similarities and differences of traditional real estate product types including office, R & D, retail, warehouses, single family and multi-family residential, mixed use, and land as well as "specialty" uses like golf courses, assisted living, and fractional share ownership. Emphasis is on concise analysis and decision making. We discuss the development process with topics including market analysis, site acquisition, due diligence, zoning, entitlements, approvals, site planning, building design, construction, financing, leasing, and ongoing management and disposition. Special topics like workouts and running a development company are also discussed. Course lessons apply to all markets, but the class discusses U.S. markets only. Throughout the course, we focus on risk management and leadership issues. Numerous guest lecturers who are leaders in the real estate industry participate in the learning process. Format: predominately case analysis and discussion, some lectures.

Also Offered As: REAL 8210

Mutually Exclusive: REAL 3210

Prerequisite: REAL 7210 OR FNCE 7210

1 Course Unit

**ARCH 7710 Professional Practice II: The Practice**

The discipline of architecture demands an inquisitive mind capable of synthesizing a multitude of technical, aesthetic, social, environmental, and conceptual elements. This essential characteristic is not limited to the mere creation of built spaces; it also extends to formulating a process of labor that is both responsible and fair, and capable of adapting to the ever-changing conditions of the world. In ARCH 7710, students explore the intricacies of running a successful architectural practice within the contemporary construction, liability, and regulatory environment. Building upon the knowledge gained in ARCH 6710, this course examines how an architectural office can be strategically designed to facilitate seamless execution of design and construction processes. Throughout the course, a wide range of essential topics is covered. These include issues related to finance, liability, ethics, and the regulatory codes that significantly impact the design and construction industry. By addressing these critical aspects, students gain valuable insights into the operational aspects of an architectural practice, ensuring they are well-prepared to navigate the complexities of the professional sphere. The lectures in ARCH 7710 effectively bridge the gap between the students' studio design knowledge and real-world practice. Drawing from the instructor's extensive experience in the field, local building examples are presented, enriching the learning experience. Additionally, the course features guest lectures by relevant professionals, who share their expertise, experiences, and insights. This exposure to industry practitioners enhances students' understanding of the architectural landscape and prepares them for the challenges and opportunities they may encounter in their careers.

Fall

1 Course Unit

**ARCH 7820 Architecture Study Abroad Program**

A four to six week program of study in various locations. For program details: [www.design.upenn.edu/architecture/graduate/graduate-architecture-study-abroad](http://www.design.upenn.edu/architecture/graduate/graduate-architecture-study-abroad)

0-1 Course Unit

**ARCH 7899 Architecture Topics**

Architecture Topics courses vary with each semester. Topics courses can feature current events relevant to the semester in which the course is offered, be taught by a visiting lecturer, or have another reason for being offered only once or twice. Detailed descriptions of topics courses, when offered, are included in "Section Details" on Path.

1 Course Unit

**ARCH 7910 M.Arch Summer Workshop**

This is a non-credit course for entering Master of Architecture students. The course will cover digital modeling and workflow and will prepare students for techniques used in the Architecture program's 5000 and 6000 level design studios. Course enrollment is by permit only.

Summer Term

0 Course Units

**ARCH 7920 ARCH Summer Institute: Advanced Architectural Design Digital Workshop**

This is a non-credit course for entering Master of Science in Design: Advanced Architectural Design students. The Digital Methods workshop provides a comprehensive introduction to four elements critical to the workflow of the graduate studios at the Weitzman School of Design: 3D modeling, scripting, visualization and fabrication. Short daily lectures situating digital technologies in contemporary design practice are followed by hands-on tutorials in Maya and Rhinoceros. The first half of the workshop provides an operative knowledge of the many geometry types, modeling techniques, scripting languages and simulation tools available for studio work. Visualization techniques are also introduced, and students will learn to efficiently produce presentation-quality renderings, animations and technical line drawings from digital models. Students also learn protocols for transferring data between various design software packages and how to create data compatible with Weitzman's digital fabrication equipment. Course enrollment is by permit only.

Summer Term

0 Course Units

**ARCH 7930 ARCH Summer Institute: History of Architecture**

This is a non-credit course for entering Master of Architecture students. The course will cover western architecture from ancient Egypt to the modern age and will satisfy the history pre-requisite condition for matriculation in the fall. Course enrollment is by permit only.

Summer Term

0 Course Units

**ARCH 7940 ARCH Summer Institute: Physics for Architects**

This is a non-credit course for entering Master of Architecture students. The course will cover the following: mechanics, heat, light, sound and electricity. The course will satisfy the physics pre-requisite condition for matriculation in the fall. Course enrollment is by permit only.

Summer Term

0 Course Units

**ARCH 7990 Environmental Building Design Summer Preparatory Workshop**

This is a required, non-credit course for entering Master of Science in Design: Environmental Building Design students. The workshop provides an introduction to digital modeling and scripting techniques for environmental performance analysis. Students also learn protocols for transferring data between various design software packages and how to create data compatible with the School of Design's plotting and digital fabrication equipment. Course enrollment is by permit only.

0 Course Units

**ARCH 8000 Introduction to 3D Programming**

ARCH 8000 is a two week required introductory course for matriculating RAS students. This course introduces computer programming (Python, Grasshopper, etc.) within a 3D modelling/simulation environment, and introduces students to Penn's ARI Robotics Lab.

0 Course Units

**ARCH 8010 Material Agencies: Robotics & Design Lab I: Part I**

Material Agencies Section 1 is the half-semester introductory studio to the Master of Science in Design: Robotics and Autonomous Systems (MSD-RAS) program at the University of Pennsylvania Stuart Weitzman School of Design. This course will introduce students to the Robotic Lab through a software / hardware routine to engage the ABB IRB4600-60 6-axes industrial robot with a hot-wire foam cutting end effector. The studio focuses exclusively on working with an industrial robotic arm and a large-scale hot-wire cutter end-effector to cut foam. This relatively simple robotic extension quickly introduces students to the robotic lab, robot interface and ultimately produces tangible results quickly, yet also highlights the designer's need to develop designs within geometrical constraints that are tightly related to specific manufacturing processes – in this case, the hot-wire cutter's production of ruled surface geometries. Operating through ruled surface geometries enables the designer to have maximum control over the manufactured output whilst removing the need for post-design geometric rationalization or value engineering activities. The architectural project for the studio is a speculative ceilingscape re-design for one of the large galleries in Meyerson Hall that currently features a ubiquitous hung acoustical tile system.

1 Course Unit

**ARCH 8011 Material Agencies: Robotics & Design Lab I: Part II**

The Fall Material Agencies course consists of two half-semester long sections and is supported by two aligned Core Technical Seminars of half-semester length each. Students will typically work in pairs. Section 1: Programmed Matter: Introduces students to a generative approach to digital design and robotic manufacturing with the goal of unifying design and production within one creative process. The studio will commence with students gaining first-hand experience programming and operating Penn's industrial robots. 3d design models will be developed in parallel to fabrication experiments and digital simulations. The design brief will focus on a small scale design prototype that is explored at a micro-scale of resolution relative to normative architectural practice. Material placement and material affect will be considered intrinsic to design expression and integral to considerations of space, form, structure and production concerns. The brief will focus on a small scale object or architectural part design with ornamental features. The course introduces material dynamics, robot programming, 3d modelling and computer programming within design. Section 2: Manipulative Matter explores both robotic fabrication and the use of sensors and actuators within responsive fabricated objects or architectural elements. Design Prototyping involving manipulation-based Manufacture. Eg. Sheet metal folding. This will complement the first studio by requiring more pre-determined design intent, fabrication rationalization and robot sensor and electrical integration. A final design prototype will demonstrate embodied material intelligence - through an integrative approach to material organization, electronic circuitry, production and design. Electronic wiring and parts will be integrated within larger material prototypes through fabrication methods such as: inlays, additive manufacturing, casting, soldering, painting, laser-cutting, or milling.

Fall

1 Course Unit

**ARCH 8020 Material Agencies: Robotics & Design Lab II**

This course will leverage knowledge gained by students in the Fall and set an ambitious aim for the experimentation, development and demonstration of a robotically manufactured design prototype that is intrinsically related to a bespoke production process. The end product will involve a 1:1 part or whole, physically fabricated work that will be accompanied by either a live demonstration or video production. During the first half of the semester students will engage in the development of bespoke robotic tooling, sensor and programming capabilities in order to create novel manufacturing processes that explore ideas of intelligent or autonomous manufacturing with an emphasis on responsive or manipulation based processes. Industry processes will be leveraged yet re-cast through creative engagement with manufacturing materials, tools and production operations. Participants will follow a brief that specifies a line of inquiry or scenario, whilst allowing some degree of self-direction. Projects will engage in a speculative and critical approach to architectural design, production and use while leveraging robotics platforms, methods for machine vision, sensing and learning, in addition to an engagement with material dynamics and computer programming within design research. A successful project is expected to: demonstrate a rigorously crafted design artifact; explore novel approaches to design, material fabrication and user engagement, questioning the role and nature of architecture's physical and cultural contribution; and explore novel forms of robotic production and representation. Some proposals will involve live or filmed demonstrator performances. All projects will require a computer simulation or animation that demonstrates a temporal consideration for design, manufacture or use. The course introduces robot tooling, sensor-feedback procedures, 1:1 material prototyping, and building design with tectonic considerations. Examples of potentially relevant industry processes include: sheet-metal bending, incremental metal forming, additive and subtractive manufacturing.

2 Course Units

**ARCH 8030 General Overview of Algorithmic Design and Robotic Fabrication**

Directly supports ARCH 8010 Material Agencies I: Section 1. This seminar will teach students computer and robot programming skills that will be utilized to deliver a complimentary and integral aspect of design-prototyping and fabrication work. Topics will vary in application to suit the studio brief. Participants will be introduced to the Robotics Lab, and will learn to set up ABB Industrial Robot tasks. Design algorithms will be developed that establish a conceptual relationship to the manufacturing process and attempt to leverage it for creative forms of design expression whilst addressing material and production performance constraints. Examples include computer programming that simulates a material placement and robotic manufacturing process such as additive manufacturing, filament winding or weaving, and utilizes these tasks in a generative design methodology, where design character, variation in material organization is evaluated relative to performance criteria such as material quantities, production time, etc. Submissions will be technical in nature and will also be implemented within ARCH 8010 prototypes. The course provides a foundation for more specialist technical development in Semester 2.

0.5 Course Units

**ARCH 8040 Advanced RAS Programming**

This course will support ARCH 8020 Material Agencies II with a greater level of technical competency and detail. More ambitious functionality will be developed that will enable student's greater degrees of freedom and creativity in their engagement with design and production processes. While students will not engage in science/engineering development, research and software developed in such disciplines will be applied within design, fabrication and user occupation orientated scenarios. Topics will vary in application to suit studio briefs and shifting capabilities within industry and academia. Examples include mechanical and electrical design for bespoke robot tooling, use of Computer Vision for real-time sensing and live behavior-based adaptation, machine learning in design or fabrication applications, or deeper engagement in robot communication and control (E.g. Linux ROS Robot programming framework).

1 Course Unit

**ARCH 8050 Intro to Cyberphysical Systems**

Directly supports ARCH 8010 Material Agencies I: Section 2. This seminar will teach participants to design and assemble electronic circuits using sensors/actuators and micro-controllers, and to program digital and analogue means of data exchange. Students will develop a closed or open loop reactive system that consists of embedded sensor systems that will operate within the Design Studio project prototype, and utilizes feedback from sensors to drive designed affects (E.g. kinetic, lighting, variations in porosity). The course will consider degrees of control, feedback, energy and force in relation to interactions of matter, space and active bodies (human and non-human). Participants will learn how to design electric circuits, solder and weld these and to integrate circuits with micro-processors, sensors and actuators. Exact equipment and methods will vary over time as these technologies evolve rapidly. At present possible micro-controllers utilized include Arduino, Raspberri Pi, Odroid, Intel Nuc, Atom and others. Sensors such as flex, pressure and proximity sensors will be utilized. Possible forms of actuation include servo and stepper motors, linear actuators, NiTinol muscle wire, pneumatic actuators. A Programming Language will be utilized to for the writing of simple control algorithms that clarify how input and output data is processed and acted upon, with a particular focus on leveraging physical world actions within a designed control loop where possible.

0.5 Course Units

**ARCH 8060 Experimental Tooling**

This course aims to extend knowledge into state of the art materials, material applications and fabrication methods and contribute research and experimental results towards ARCH 8020 Material Agencies II course prototypical projects. Operating predominantly through research and controlled physical experiments, students will develop a material strategy for their ARCH 8020 Material Agencies II work, investigating scientific research papers, industry publications and precedent projects in order to develop know-how in materials and material applications. A material application method will be proposed and experimented with to evaluate and develop use within a robotic fabrication process. Submissions will incorporate experimental test results, methods and precedent research documentation.

1 Course Unit



**ARCH 8070 RAS Theory**

This seminar provides a theoretical context to the program, relating autonomous robotics and fabrication research to architectural discourse, philosophy, science and technology. The course commences with a historical overview of scientific topics including cybernetics, complexity theory, emergence/self-organization, evolution/developmental biology, behaviour-based robotics. The course also critically assesses present and future societal trajectories in relation to technology, exploring socio-political, ethical and philosophical arguments that concern a broader technological shift that has occurred during the last decade which has given rise to our unquestioned reliance on algorithms within our everyday lives (social media, shopping, navigation), and similar impact from Urban OS's, Industry 4 and driverless car technologies. Readings cover philosophy, computer science, cybernetics, robotics, sociology, psychology, and will be discussed in relation to their consideration within the domain of architectural design and building technology. Examples include: Blaise Agüera y Arcas, Maurice Conti, Norbert Wiener, Kevin Kelly, Ray Kurzweil, Ed Finn, Donna Haraway, Andre Gorz, Bruce Sterling, Daniel Kahneman, Timothy Morton, Levi Bryant. A theoretical written statement related to ARCH 801 Material Agencies I Section 1 or 2 will be produced by participants within this core seminar.

1 Course Unit

**ARCH 8080 Scientific Research and Writing**

Following a framing of architectural design-research and theory in Semester 1, this course aims to provide students with knowledge of state of the art robotics and design taking place in the research community and to introduce methods to evaluate and demonstrate academic research that encompasses both creative and technical work. Submissions will include a technical written statement related ARCH 8020 Material Agencies II work, which will be produced by participants under direction within this core seminar. This will train students for additional technical career opportunities and raise the level of discourse and prospects for further research from the program and its participants to a level suitable for continuation within PhD studies.

1 Course Unit

**ARCH 8110 Theories of Architecture: Environments, Techniques, and Expressive Means**

This theory seminar provides an in-depth review and discussion of key architectural topics and texts, published from the 19th century until today. It is a required course for students in the PhD program in architecture and in the Master of Science program, who come from both technology and history and theory backgrounds. Both areas of research share the necessity to understand how ideas condition and inspire the practice of architecture, and how architectural creation contributes to the way one thinks discursively about the world. The seminar is designed to equip those embarking on careers in teaching, scholarship, and research in architecture with the practices, methods and habits of scholarly inquiry that are typical in the field. The preparation and experience of seminar activities provide both technical skills and knowledge in a range of topics pertinent to architectural research in the 21st century.

Fall

1 Course Unit

**ARCH 8120 Methods In Architectural Research**

Methods in Architectural Research is a seminar aimed at first year, second semester PhD and MS students in Architecture who aim to develop their field definition (biblio + statement) and/or research proposal in pursuit of their advanced research degree. The course is also of interest to M.Arch students interested in advanced forms of academic research. The course will cover the full context of research methods in both the humanities and sciences attendant to architecture. Students will be tasked with identifying and naming a field of study, an initial research question to investigate, a methodology they will employ, and a value proposition for their work.

Spring

1 Course Unit

**ARCH 8130 Qualifying Research**

This is an independent study course for first year Ph.D. and M.S. students, supervised by a member of the Graduate Group in Architecture. A course of readings and advisor sessions throughout the semester will result in an independent study paper, which will also be used as the student's qualifying paper for the Qualifying Examination. This research paper will be prepared as if for scholarly publication.

Spring

1 Course Unit

**ARCH 8140 The Concept of an Avant-Garde**

No historian of architecture has written as intensely about the contradictions of architecture in late-modern society or reflected as deeply on the resulting problems and tasks of architectural historiography as Manfredo Tafuri (1935-1994). For many, the Italian historian's dismissal of "hopes in design" under conditions of advanced capitalism produced a disciplinary impasse. This in turn led to a call to outlier Tafuri - to move beyond his pessimistic and lacerating stance. The seminar will undertake a close reading of one of Tafuri's most complexly conceived and richly elaborated books, *The Sphere and the Labyrinth: Avant-Gardes and Architecture from Piranesi to the 1970s*. Initially published in Italian in 1980 and translated into English in 1987, the book represents the first effort to define and historicize the concept of an avant-garde specifically in architecture. Its content centers on the radical formal and urban experiments of the first three decades of the twentieth century. Yet Tafuri surprisingly begins his account with the eighteenth-century inventions of Piranesi, and he concludes with an examination of the "neo-avant-garde" of his own day. In addition to traversing *The Sphere* and the *Labyrinth* chapter by chapter - starting with the extraordinary methodological introduction, "The Historical 'Project'" - we shall also read a number of primary and secondary sources on the historical contexts under discussion and consider a number of important intertexts that shed light on Tafuri's position. The objectives of the course are at once historical and historiographic: we shall be concerned both with actual events and with how they have been written into history. Finally, we shall reassess the role of an avant-garde in architecture and compare Tafuri's conception to that advanced in other disciplines. Is the concept of an avant-garde still viable today? Or should it be consigned to the dustbin of twentieth-century ideas?

Spring

1 Course Unit



**ARCH 8150 Research Report**

The candidate for the M.S. in Architecture degree shall prepare a research report in his or her subject of study. The topic of this report must be approved by an advisor. This report will be developed in the independent study courses, undertaken after the eight units of course work has been completed, normally in the summer semester. The purpose of these courses is to give the student an opportunity to synthesize their previous coursework at Penn. Course enrollment is by permit only. Please contact Sarah Lam (ARCH Dept.) at sarahlam@design.upenn.edu.

Fall

2 Course Units

**ARCH 8160 Advanced Topics in Architecture Culture from World War II through 2001**

This directed reading, research, and writing seminar will explore historical developments in architecture related to the same time frame as ARCH 5120 but in greater depth and at a more advanced level. In-class conversations will be focused around specific case studies, some determined by the instructor, others selected by the members of the seminar. Problems of historiography—including periodization, reception, archives, canon and counter-canon, and other methodological and theoretical issues—will also be discussed. This is an opportunity for students to develop a substantial research paper on a topic of their own choosing over the course of a semester. The class is open by permission to students with a solid background and strong interest in the architectural history of the last three quarters of a century.

Spring

1 Course Unit

**ARCH 8201 PhD Talks ARCH Pro Seminar**

This seminar introduces first year PhD students in Architecture to the larger academic context of doctoral programs. Students are introduced to questions of academic scholarship and freedom, types of research trajectories and technologies, the art of publication, and career trajectories made possible by the PhD process. Course methods include required attendance at weekly seminars offered by returning students, graduate group faculty, graduates of the program, and invited guests. Students are tasked with preparing weekly readings in order to lead the question and discussion session that follows each seminar presentation. In maintaining the tradition of the program's PhD Talks, while some of the seminar sessions are open to the larger doctoral community that includes its students and faculty, others are dedicated exclusively to registered students. An important goal of the seminar is to introduce all students to each other and to create a vertical community of scholars across both sub-areas of history/theory and technology.

0.5 Course Units

**ARCH 8202 PhD Talks ARCH Proseminar II**

The second half of the two part PRO -SEMINAR is aimed at first year PhD students in Architecture and continues the work of integrating students to the PhD community of scholarship. Students further interrogate questions of academic scholarship and freedom, types of research trajectories and technologies, the role of publications, and career trajectories. Course methods are similar to the first semester including attendance at weekly seminars offered by returning students, graduate group faculty, graduates of the program, and invited guests. Students are tasked with preparing weekly readings in order to lead the question and discussion session and written pieces of scholarship. In maintaining the tradition of the program's PhD Talks, while some of the seminar sessions are open to the larger doctoral community that includes its students and faculty, others are dedicated exclusively to registered students. An important goal of the seminar is to introduce all students to each other and to create a vertical community of scholars across both sub-areas of history/theory and technology.

Spring

0.5 Course Units

**ARCH 8510 Field Bibliography**

This course is essentially an independent study, undertaken by doctoral students in preparation for the Candidacy Examination. This course should be taken in conjunction with ARCH 8520 after all other courses have been completed. Normally a member of the student's Dissertation Committee supervises this course.

Two Term Class, Student may enter either term; credit given for either 1 Course Unit

**ARCH 8520 Dissertation Proposal**

This course is essentially an independent study, undertaken by doctoral students in order to write the Proposal for the Dissertation. The Proposal is prepared before and defended during the Candidacy Examination. This course should be taken in conjunction with ARCH 8510 after all other courses have been completed. Normally a member of the student's Dissertation Committee supervises this course.

Two Term Class, Student may enter either term; credit given for either 1 Course Unit

**ARCH 9925 Independent Study: Dissertation Preparation Research**

This independent study is reserved for students in the Architecture PhD program to focus on research related to their dissertation prior to passing the Candidacy Exam. This course cannot be counted towards the credits required for the degree.

0-3 Course Units

**ARCH 9950 Dissertation**

Writing and submitting a dissertation are among the final steps leading to the award of the PhD degree. At the University of Pennsylvania, a student presents and defends the dissertation publicly, and then, with the approval of the dissertation committee and graduate group chair, submits the final manuscript for publication. Finally, the PhD degree is awarded to the candidate upon the recommendation of the Graduate Council of the Faculties.—PennLibraries

Two Term Class, Student may enter either term; credit given for either 0 Course Units

**ARCH 9980 Independent Thesis Study**

Independent Thesis Study

1 Course Unit

**ARCH 9999 Independent Study**

This course enables students to undertake self-directed study on a topic in Architecture, under the supervision of a faculty member. Students are required to make a proposal for the study to the Department Chair, outlining the subject and method of investigation, and confirming the course supervisor at least two weeks prior to the beginning of the semester.

Fall or Spring

0.5-2 Course Units