Designing Public Spaces: the architecture of exposed structures

GSAPP Advanced Structures Elective – Draft Course Syllabus

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Course #: A4882
Credit Hours: 3 points
Classroom location and time: Fayerweather 203

Instructor: Hermona Tamrat, P.E.
Office hours: TBD

Introduction

Excellent architectural design is a commodity with a high price tag accessible to few. This course posits good design is a civic right. How would such framing transform our public spaces? Many of us (arguably all, as members of this campus community) have had the privilege of personally experiencing the impact of well-designed spaces – on our health and well-being, on our access to resources, on our productivity and ability to advance scholarship, on our relationship to our environment, on our sense of place, of belonging. *Architectural design in the public sphere, that which is available and accessible to all community members, is an opportunity and responsibility to advance social equity.*

The outdoor public sphere provides a unique structural case study – these are often open-air, exposed structures with no additional cladding or finishes. *The structure is the architecture, and the architecture is the structure*. A strong understanding of structural analysis is necessary for architects to successfully and intentionally design such public spaces. Furthermore these are spaces available to everyone to interact with and live amongst, access is not limited or restricted by residence, ticketing, or membership.

Over the course of the semester, through lectures, case studies, weekly assignments, a mid-term exam, and a final design project, you will gain a solidified understanding of basic statics, comfort with structural load paths and structural framing systems, and experience in structural design from conceptual to full design development.

Course Structure

This course will be held at [classroom TBD]. The first half of the course will be focused on statics and the fundamentals of structural analysis utilizing architectural case studies, weekly assignments, and a mid term exam. The second half of the course will be focused on individual design projects, developed with the guidance of weekly assignments employing the analysis skills established in the early part of the course.

Structural Reference Standards (text excerpts to be provided)

ASCE 7
AISC
ACI
NDS-AWC

Presentation Software

Rhino
Revit
AutoCAD
Adobe Illustrator
Any visualization tools you are comfortable using

Mid-term Exam

There will be one mid-term exam. The exam will be in-person, and consist of problems akin to the homework assignments. The mid-term exam will account for 30% of your overall grade.

Assignments

Each week you will have individual assignments on statics, structural analysis, and/or the development of your projects. It is encouraged to support one another in study groups, but please note that it is mandatory that each assignment is very clearly completed individually. Collaboration is a powerful tool in collective knowledge sharing and strengthening your learnings but be mindful that it remains a tool substantiating your learning. If not used with intention, it will do you a disservice and leave you ill-prepared for the midterm exam.

Assignments are your individual learning opportunities; thus they will not be graded based on accuracy of answers but on completeness. Thorough and clear work exhibiting your thought process and full effort will be graded equally whether or not your final numerical answers are accurate. The beginning of each class will be utilized to review the homework assignment solutions in detail as a class, to discuss the correct answers and methodology, and to answer questions. It is the responsibility of each student to redline and correct their own homework during the in-class review and to ask questions to ensure clarity. This will be the most effective way for you to stay on top of the weekly lessons and be prepared for the mid-term exam. Incomplete or copied assignments will be marked incomplete.

All assignments are to be submitted as PDF's by midnight the day before class is held each week. Your top homework assignment marks will be utilized in final grading for the course, of which assignments make up 35%.

Final Project

Your final project will be the design of an open-air public space of your choosing at one of 3 sites. You may choose the type of service/program provided (transit hub, outdoor market, outdoor sports/athletic space, public garden/plaza, etc.)

You are also free to select the construction material type. The material selection should be relevant and logical to the site and surrounding architecture, the structural use, and the visual impact as an exposed structure. It is encouraged to research the relevance and availability of the construction materials to your selected site (including but not limited to sustainability consideration of the use of local materials versus imports).

You will be required to submit a set of conceptual architectural-structural drawings inclusive of plans, elevations, sections, and axonometric views. You will also be required to submit and present the structural analysis of your final design project including a load take down, slab loading and design forces, tributary areas for all beams and columns, designated lateral system, and the sizing of all slabs, beams, and columns for both gravity and lateral forces.

At your final presentation, you will present your physical scale model and present your architectural-structural design via pdf presentation. You are encouraged to pin up selected drawings, views, renderings that best communicate your design.

Physical Model

For your final project, each student will be required to create a scale architectural-structural model of their design, articulating the form, materials, and relationship to the site.

Attendance

Attendance is required at each lecture. All classes and assignments build on the knowledge of the prior class so it is required to attend each class.

Maintaining your health is paramount - it is understood you may be forced to miss a class when you are ill. When illness prevents attendance, it is your responsibility to proactively take responsibility to catch up on the lecture materials and utilize the resources available to you (myself, your TA, your classmates) so as to not fall behind.

Pre-requisites
Algebra
Trigonometry
High school physics
Statics (recommended, not required)

Grading
Assignments – 35%
Midterm – 30%
Final Project – 35%

Reading List (in progress)

"The Design Politics of Space, Race, and Resistance in the United States", Stephen F. Gray & Annie Lin
"Spaces of Co-Liberation", Ana Maria Leon
"Colonial Ramifications", Samia Henni
Manual of Anti-Racist Architecture Education, Cruz Garcia & Nathalie Frankowski
Teaching to Transgress, bell hooks

Schedule Summary:

Lecture 1	*Course Introduction; Intro to Statics: Forces and Vectors* Introduction to course concepts and structure, the assignments, the final project, general requirements. Lesson 1 on foundations of statics: forces and vectors.
Assignment 1	Problem set on forces and vectors.
Lecture 2	*Statics: Free Body Diagrams and Equilibrium* Lesson 2 on continued basics of statics: free body diagrams, and equilibrium
Assignment 2	Problem set on free body diagrams and equilibrium.
Lecture 3	*Structural Design: Load Paths and Load Takedowns* Lesson 3 on simple tributary areas/loads on beams and columns. Statics and free body diagrams with corresponding/related case studies.
Assignment 3	Problem set on determine tributary areas/loads on beams and columns
Lecture 4	*Structural Design: Gravity Systems + Materials* Understanding the full structural system for gravity: slabs, beams, columns/walls, foundations. Structural properties of different construction materials and the pros + cons when utilized in various gravity systems/components.
Assignment 4	Problem set on gravity systems and the impact of material selection.
Lecture 5	*Structural Design Lateral Systems +* Types of lateral systems, why structures require them, types of lateral loads. Structural properties of different construction materials and the pros + cons when utilized in various lateral systems and components
Assignment 5	Problem set on lateral systems.
Lecture 6	*Recap and Midterm Review*
Assignment 6	Revise for midterm

MIDTERM / SPRING BREAK

Lecture 7	*Architectural-Structural Design Project: Introduction + Load Takedown* Introduce final project parameters and requirements. Recap/review load takedown
Assignment 7	Submit conceptual design sketches of your public space – clearly represent all slabs/roofs, beams, and columns (no sizing of material selection yet required).
Lecture 8	*Architectural-Structural Design Project: Gravity + Lateral system; Peer reviews* In small groups, give architectural feedback and comments to each others' designs. Recap/review questions on load takedowns ahead of assignment
Assignment 8	Refine/progress design based on peer feedback. Submit a complete load takedown, gravity system layout and lateral system layout for your refined design.
Lecture 9	*Architectural-Structural Design Project: Guest Critic Review(TBD)* Invite other faculty or outside architectural professional for desk-crits. Recap/review questions on statics and force equilibrium ahead of assignment.
Assignment 9	Refine/progress design based on desk-crit feedback. Submit construction material selection and structural elements sizing based on static analysis of each component.
Lecture 10	*Recap/open classroom review*
Assignment 10	Wrap up final projects.
Lecture 11	*Architectural-Structural Design Project:* ***FINAL PRESENTATIONS***
Assignment 11	