ARCH A085N: ENVIRONMENTAL DESIGN SYSTEMS NONCREDIT

Item	Value
Curriculum Committee Approval Date	12/07/2022
Top Code	020100 - Architecture and Architectural Technology
Units	0 Total Units
Hours	144 Total Hours (Lecture Hours 36; Lab Hours 108)
Total Outside of Class Hours	0
Course Credit Status	Noncredit (N)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	Yes; Repeat Limit 99
Grading Policy	P/NP/SP Non-Credit (D), • Letter Non-Credit (L)

Course Description

This intermediate design course focuses on the environmental, cultural, and physical forces that affect architecture. Students will research and utilize design approaches and building components/systems that respond to human needs and the natural and built environments. Study topics will include site design and cultural context, environmental/climate responsive approaches to design, maintaining structural design integrity, incorporating life safety and access, and ecologically minded approaches to design. NOT DEGREE APPLICABLE. Not Transferable. ADVISORY: ARCH A180 or comparable course completion or work experience.

Course Level Student Learning Outcome(s)

1. Verbally and graphically present a design that is environmentally responsible; rationalize the systems they have incorporated into their design; and document the technical strategies and calculations considered necessary for environmental design.
2. Produce a case study design process portfolio and an environmental reference notebook that documents their research and practical application of environmental strategies in a format that is appropriate for academic and professional portfolio advancement, as assessed by the instructor.

Course Objectives

- 1. Generate a design theory and architectural project that responds to a specific environment.
- 2. Evaluate the physical characteristics of a landscape and generate appropriate design criteria.
- 3. Analyze the cultural context of a site and develop a responsive design intention.
- 4. Analyze the natural environment (including sun, wind climate).
- 5. Formulate a design that provides human environmental comfort.
- 6. Assess, select, and apply appropriate structural systems to a design.
- 7. Describe the structural integrity different materials including its strengths and weaknesses.
- 8. Assess, select, and apply appropriate human support systems (plumbing, power, temperature).
- 9. Develop an architectural program that assesses spatial needs and balances structural environmental system requirements.
- 10. Adapt a program to meet code requirements and optimize life safety while maintaining design integrity.
- 11. Evaluate and apply appropriate vehicular and handicapped access design to ensure safe and ethical building access and site circulation.
- 12. Integrate and prioritize multiple building systems into a design solution that supports a design theory.
- 13. Analyze and apply appropriate uses of building technology and sustainable systems.
- 14. Visually and verbally communicate an architectural design project that integrates and optimizes principles of sound structural and environmental design, and integrates principles of access and life safety.
- 15. Illustrate an architectural design in a portfolio format.

Lecture Content

This environmental design studio covers sustainable design strategies, structural principles, and cultural/contextural issues in a project-based studio. The course consists of a series of lecture and activity-based units on the technical aspects of environmental design integrated with a design project that provides the opportunity to do a site-specific analysis of culture and context, and to develop an appropriate design proposal.
Topics listed may be more or less emphasized as appropriate to the design project assigned. Competitions may be used for the design project and have included: Cradle to Cradle Home Design, Leading Edge Design Competition, and Design for the Children (an international competition for a health clinic for East Africa). Landscape Typologies Context Geology and the physical landscape as a setting Understanding soil, water, and wind patterns Eco-systems and human co-existence/ interventions The built environment as context Cultural Context Setting Assessing patterns of land stewardship in the natural and built landscape Recognize and assess cultural relationships to the landscape Study psychological responses to the landscape Analyze design intention as a response to the context of a site Solar Design Principles Natural lighting Thermal control and collection Cultural seasonal relations to the sun Technical solar control systems Site planning in response to solar access Climate Control and Human Comfort Perception Human temperature and humidity needs Cultural responses to climate Designing for water and snow Designing for humid and arid climates Wind and the effects of ventilation Mechanical approaches to climate control Ar chitectural design as a response to climate (perceived and real) Natural Physical Forces and Structure Gravity and the concept of static balance Wind and the effects of uplift and lateral movement Earthquakes and the concept of energy dispersal Design loads and structural systems Using structural systems to achieve balance and shelter Regional structural typologies Modern structural typologies as a response to globalization Structural Systems: Wood Light weight framing systems Heavy timber Manufactured wood systems Historical and modern applications Structural Systems Foundation systems Massing and structural considerations Light weight steel framing systems Structural steel framing Cladding systems Planar wall and floor systems Post and lintel systems Thrust buttressing concepts Historical and modern applications Human Support Systems Water and plumbing systems

Waste and sanitary systems Electrical lighting systems Heating, Cooling, Ventilation Balancing and Integrating Structural Environmental Systems Through Programming Optimizing design intention Analyzing spatial requirements in regards to volume and capacity needs Analyzing spatial requirements in regards to structure environment needs Developing an architectural program of spatial needs Integrating Code Requirements Optimizing Life Safety Structural failure and design considerations Smoke/Fire protection and the concepts of timed failure detection Exiting and circulation Health issues: lighting, ventilatio n, water, sanitation Designing for Vehicular Handicapped Access Optimizing design intention through entry sequences Vehicular access parking standards Handicapped parking unloading Path of travel, level changes, and ramps Hardscape systems and materials Exterior lighting and safety Making Architecture: Integrating and Balancing Building Systems Design Theory Analyzing site context Understanding cultural context Analyzing appropriate uses of technology Integrating systems to support design intention Spaceship Earth: Considering the Ecological Impacts of Building "Green Architecture" and sustainable design Renewable building materials minimizing waste LEEDS Certification Regenerative design Adaptive reuse of existing and historical structures Communicating Technical Aspects of Design Plan drawing as a method for analyzing and communicating programming, site design, and access Sectional drawing as a method for analyzing and communicating integration of multiple systems Modeling as a means of analyzing and communicating structural systems and integration with environmental systems and design intent Combining images and text to communicate understanding of integration of multiple systems Reproducing the work into a portfolio format

Lab Content

The lab component will apply the Course Content listed for the course through the use of project-based learning activities. Students will have one or more projects and several design exercises that correspond to the lectures and that require the implementation of principles learned in the lectures, reading materials, as well as technical research done online. Sustainability: Green Studio Exercises Siting and Passive techniques Daylighting studies Building Envelope comparisons Alternative Energy calculations Heating Cooling calculations Water Waste system alternatives Integrating Code Requirements into a project Structural Building codes Accessibility Exiting Life Safety Technical Documents Developing Project Details Sections Plans Design Documents Project Portfolio Develop concept diagrams images Develop systems document Present work in board layout Reproduce work in portfolio format

Method(s) of Instruction

- Enhanced NC Lect (NC1)
- Enhanced NC Lab (NC2)
- Online Enhanced NC Lect (NC5)
- Online Enhanced NC Lab (NC6)
- Live Online Enhanced NC Lect (NC9)
- Live Online Enhanced NC Lab (NCA)

Instructional Techniques

Methodologies are consistent with the professional design process and university environmental studio courses, which include: instructor lectures, class discussions, field trips, individual and small-group assignments that demonstrate the application of different design intentions to solve environmental challenges and demonstrate knowledge of course material, and a challenge project that integrates and applies the knowledge obtained.

Reading Assignments

Reading Assignments follow the text book (Green Studio Handbook) and may also include additional project-specific reading assignments and online research.

Writing Assignments

Critical thinking skills will be demonstrated through the design, drawing, and modeling of architectural solutions to environmental factors and context. Some writing will occur in the form of informational summaries and graphical text on visual presentations (such as presentation boards, portfolios, and digital media presentations).

Out-of-class Assignments

Typical assignments include Field Study Reports, Lecture Topic Practical Assignments, and Design Projects. All of these assignments will need time outside of class to complete them (approx 6-8 hours per week).

Demonstration of Critical Thinking

Critical thinking skills will be demonstrated through the design, drawing, and modeling of architectural solutions to environmental factors and context. Additionally, information collected (visual and verbal), reference work, calculations, quizzes (written and graphic), project presentation, and portfolios will demonstrate critical thinking and learning.

Required Writing, Problem Solving, Skills Demonstration

Some writing will occur in the form of informational summaries and graphical text on visual presentations (such as presentation boards, portfolios, and digital media presentations). Quizzes will also contain brief written answers.

Eligible Disciplines

Architecture: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Kwok. Green Design Studio Handbook, Current ed. New York: Elsivier Publishing, 2021

Other Resources

1. Drawing and sketching media, drafting tools/supplies, model-building tools/supplies, art supplies, and digital file storage media (such as USB drives) to be provided by students. Hand outs and limited supplies to be provided by instructor. 2. Tools and model-building equipment (saws, drills, sanders, laser cutters) will be needed for construction of models. 3. Computers of significant speed and memory in order to run the software listed.