

## **ARC 481: ENVIRONMENTAL DESIGN III: ENERGY & SYSTEMS     3 credits**

**Course Description:** The study of the influence of energy, human comfort, climate, context, heating, cooling and water on the design of buildings and sites. The design of passive and active environmental systems with continued emphasis on daylighting, acoustics and design strategies for sustainability. Not for graduate credit. Prerequisites: PHYS 203B, 253B. Restricted to major.

### **Course Goals and Objectives:**

Upon completion of this course, the student will:

1. Develop an understanding of global climate and resources in relationship to the design of individual buildings and site and be introduced to the principals of sustainable design with emphasis on indigenous architecture.
2. Develop an understanding of the basic principles of ecology and responsibilities with respect to environmental and resource conservation in architecture and urban design.
3. Develop an understanding of parallel and divergent canons and traditions of architecture, landscape and urban design including examples of indigenous, vernacular, local, regional, national settings from the Easter, Western, Northern, and Southern hemispheres in terms of their climatic, ecological, technological, socioeconomic, public health, and cultural factors.
4. Develop an understanding of the role of applied research in determining function, form, and systems and their impact on human conditions and behavior.
5. Develop the ability to gather, assess, record, apply and comparatively evaluate information within architectural coursework and design processes.
6. Develop an understanding of climate, human comfort, and design strategies for cooling and heating.
7. Develop an understanding of sites and resources with emphases on solar access, wind, and air, rain and groundwater, and vegetation.
8. Develop an understanding of the principles of heat flow and basic principles that inform the design of building envelope systems.
9. Develop design strategies for heating and cooling with respect to zoning, daylighting, passive solar heating, passive cooling, heat loss, heat gain, and applied psychrometry.
10. Develop an understanding of HVAC systems for small and large buildings with emphases on healthy environments.
11. Develop an understanding of the use of computer programs to represent and analyze building performance.
12. Develop and understanding of water and water basics, storm water, water supply, water and waste, and solid waste.
13. Develop an understanding of basic plumbing principals and the ability to layout systems.
14. Develop an understanding of fire protection and suppression systems.
15. Develop an understanding of building signal systems, automation and transportation within buildings.

**Student Performance Criteria:**

**B.3:** Sustainability **B.5:** Life Safety **B.8:** Environmental Systems  
**B.10:** Building Envelope Systems **B.11:** Building Service Systems  
**C.2:** Human Behavior

<b>Topical Outline</b>	<b>Percentages of Time</b>
I. Context for Building Systems Design	7%
II. Climate, Comfort, and Design Strategies	7%
III. Site and Resources	6%
IV. Heat Flow	10%
V. Designing for Heating and Cooling	20%
VI. HVAC Systems for Buildings	20%
VII. Water and Waste Systems	20%
VIII. Fire Protection	10%

**Textbooks:**

Grondzik, W., Kwok A., Stein B., & J. Reynolds. *Mechanical and Electrical Equipment for Buildings*. 11<sup>th</sup> ed. Hoboken, NJ: John Wiley & Sons, Inc., 2006.

Heschong, Lisa. *Thermal delight in architecture*. Cambridge, MA: MITPress, 1979.

**Offered:** Fall semester

**Faculty:** McDonald