

ARC 497B/597B Health and Wellbeing in the Built environment: A Tour of the Senses and Beyond

Spring 2019

3-credit units

Instructors: Altaf Engineer, Assistant Professor

This course is a recommended elective for MS.Arch. students in the Health and the Built Environment (HBE) program and for master's level and upper level undergraduates interested in pursuing careers that integrate human health and wellbeing in the built environment.

What we see, hear, and breathe affects our wellbeing. Consequently, designers have a profound impact on the people who inhabit their buildings. This course will offer future design professionals experience in the scientific understanding needed to capitalize on advancements in design informed by research. Designers who can not only understand, but translate existing research into practice will be more competitive in the market and have a larger impact. The course begins with a primer on scientific literacy in the context of design, followed by modules that dive into the physiology, psychology, and design implications related to our senses.

Students will learn how to find and critique research that connects wellbeing outcomes with the built environment through written *paper critiques* in each module (Visual, Haptic, Aural, Gaseous, and Natural Systems). At the end of each module, students will prepare a *design implication* strategy informed by the required readings and additional research articles. Finally, each student will prepare a final course project that critiques a current studio project or an existing built space on campus and makes design recommendations. This final project may be presented in the form of a slide deck, tailored as per the student's individual goals and expertise.

Upon successful completion of this course, students will be able to:

1. Learn how to find research articles that are relevant to health and wellbeing and the built environment.
2. Exhibit a scientific base of understanding of how existing human health and wellbeing research can impact design.
3. Critique existing research for its scientific relevancy to the design world and for the appropriateness of the methodologies used.

In addition, students who complete the graduate course will be able to:

1. Synthesize and communicate design recommendations and implications based on existing health and wellbeing research into a research report or publication.

Course structure and organization

This course meets once a week and is comprised of interactive lectures and student participation and presentations, both informal and formal. The course is broken into the following phases:

- **Introduction** to the science of health and wellbeing in the context of design
- **Module 1:** Visual systems
- **Module 2:** Haptic and Aural systems
- **Module 3:** Gaseous systems
- **Module 4:** Natural systems
- **Synthesis:** Final course project

There are regular reading assignments, and assigned tasks that involve finding and critiquing additional research articles not in the required reading list for each module. Students will also present design recommendations based off the readings for each module, and culminate with a final project that makes design recommendations for an existing space on campus or a current studio project.

Course objectives

During this course, students will:

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1. Analyze and critique existing scientific research on health and wellbeing in the built environment.
2. Communicate scientific literature critiques effectively to other students through writing, speaking, and visuals.
3. Translate research findings, both from literature and course assignments, into design recommendations in their individual projects.

The graded components of this course and their criteria of evaluation are currently anticipated to be as follows, but are subject to change as set forth above:

Texts I paper critiques

Students will submit written summaries and critiques of required readings and additional research articles found on their own outside of the reading list. Instructor will provide, in advance, a list of questions that will need to be answered as well as serve as an outline for each summary and critique. These summaries will be submitted on D2L and discussed with the class once per module and once during the course introduction weeks.

Projects I design implications

Students will present to the class a design implication based off the required readings and their own additional research articles of choice for each module. These will be submitted in PDF slide format. Students may select an existing built environment as a case study or a current studio project for this exercise.

Final project

Students will synthesize their readings over the semester into a set of evaluative criteria that inform a final project that is a critique with design recommendations for an existing space on campus or a current studio project. The format can be a slide deck or design poster—agreed upon after discussion with the instructor considering the student's future endeavors and specific skill set. Graduate students are required to prepare and submit an additional research report that has potential for publication or conference presentation in consultation with the instructor.

References

Required

Sternberg EM. *Healing spaces: the science of place and well-being*. Cambridge, Mass: Belknap Press of Harvard University Press; 2009.

Kopec DA, Szenasy SS. *Health and Well-being for Interior Architecture*. New York, NY: Routledge; 2017.

General

All other required readings for this course listed below (subject to change), are posted on the D2L site in PDF or electronic link format, and are subject to change based on developments in relevant research. Graduate student readings are in **bold**.

1. **Youngstedt SD, Kripke DF. Does bright light have an anxiolytic effect? - an open trial. *BMC Psychiatry*. 2007;7:62.**
2. Partonen T, Lönnqvist J. Bright light improves vitality and alleviates distress in healthy people. *J Affect Disord*. 2000;57(1):55-61.
3. Stevens RG, Brainard GC, Blask DE, Lockley SW, Motta ME. Breast cancer and circadian disruption from electric lighting in the modern world. *CA Cancer J Clin*. 2014;64(3):207-218.
4. Figueiro MG, Plitnick BA, Lok A, et al. Tailored lighting intervention improves measures of sleep, depression, and agitation in persons with Alzheimer's disease and related dementia living in long-term care facilities. *Clin Interv Aging*. 2014;9:1527-1537.
5. **Figueiro M, Overington D. Self-luminous devices and melatonin suppression in adolescents. *Light Res Technol*. 2015;0:10.**
6. Shin JY, Yun GY, Kim JT. View types and luminance effects on discomfort glare assessment from windows. *Energy and Buildings*. 2012;46:139-145.
7. Hwang T, Kim JT. Effects of Indoor Lighting on Occupants' Visual Comfort and Eye Health in a Green Building. *Indoor Built Environ*. 2010;20(1):75-90.

8. Leather P, Pyrgas M, Beale D, Lawrence C. Windows in the Workplace: Sunlight, View, and Occupational Stress. *Environ Behav.* 1998;30(6):739-762.
9. Benedetti F, Colombo C, Barbini B, Campori E, Smeraldi E. Morning sunlight reduces length of hospitalization in bipolar depression. *J Affect Disord.* 2001;62(3):221-223.
10. **Walch JM, Rabin BS, Day R, Williams JN, Choi K, Kang JD. The effect of sunlight on postoperative analgesic medication use: a prospective study of patients undergoing spinal surgery. *Psychosom Med.* 2005;67(1):156-163.**
11. Thayer JF, Verkuil B, Brosschot JF, et al. Effects of the physical work environment on physiological measures of stress. *Eur J Cardiovasc Prev Rehabil.* 2010;17(4):431-439.
12. Schust M. Effects of Low Frequency Noise up to 100 Hz. *Noise Health.* 2004;6(23):73-85.
13. Folscher LL, Goldstein LN, Wells M, Rees D. Emergency department noise: mental activation or mental stress? *Emerg Med J.* 2014;32(6):468-473.
14. Evans GW, Johnson D. Stress and open-office noise. *J Appl Psychol.* 2000;85(5):779-783.
15. **Waye KP, Bengtsson J, Rylander R, Hucklebridge F, Evans P, Clow A. Low frequency noise enhances cortisol among noise sensitive subjects during work performance. *Life Sci.* 2002;70(7):745-758.**
16. Kaarlela-Tuomaala A, Helenius R, Keskinen E, Hongisto V. Effects of acoustic environment on work in private office rooms and open-plan offices - longitudinal study during relocation. *Ergonomics.* 2009;52(11):1423-1444.
17. Mitchell CS, Zhang JJ, Sigsgaard T, et al. Current state of the science: health effects and indoor environmental quality. *Environ Health Perspect.* 2007;115(6):958-964.
18. Ilyas S, Emery A, Heerwagen J, Heerwagen D. Occupant perceptions of an indoor thermal environment in a naturally ventilated building. *ASHRAE Trans.* 2012;118:114-121.
19. **Allen JG, MacNaughton P, Laurent JG, Flanigan SS, Eitland ES, Spengler JD. Green Buildings and Health. *Curr Environ Health Rep.* 2015;2(3):250-258.**
20. Allen JG, MacNaughton P, Satish U, Santanam S, Vallarino J, Spengler JD. Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments. *Environ Health Perspect.* 2015:1-32.
21. Clements-Croome DJ, Awbi HB, Bako-Biro Zs, Kochhar N, Williams M. Ventilation rates in Schools. *Building Environ.* 2008;43(3):362-367.
22. Milton DK, Glencross PM, Walters MD. Risk of Sick Leave Associated with Outdoor Air Supply Rate, Humidification, and Occupant Complaints. *Indoor Air.* 2000;10(4):212-221.
23. **Melikov AK, Skwarczynski MA, Kaczmarczyk J, Zabecky J. Use of personalized ventilation for improving health, comfort, and performance at high room temperature and humidity. *Indoor Air.* 2013;23(3):250-263.**
24. Chawla L. Benefits of Nature Contact for Children. *J Plan Lit.* 2015;30(4):433-452.
25. Ulrich R. View through a window may influence recovery from surgery. *Science.* 1984;224(4647):420-421.
26. Taylor AF, Kuo FE, Sullivan WC. Views of Nature and Self-Discipline: Evidence from Inner City Children. *Journal of Environmental Psychology.* 2002;22(1-2):49-63.
27. **Kardan O, Gozdyra P, Misic B, et al. Neighborhood greenspace and health in a large urban center. *Sci Rep.* 2015;5:11610.**
28. **Kaplan S. The restorative benefits of nature: Toward an integrative framework. *J Environ Psychol.* 1995;15(3):169-182.**
29. Berman MG, Jonides J, Kaplan S. The cognitive benefits of interacting with nature. *Psychol Science.* 2008;19(12):1207-1212.
30. **Gamble KR, Howard JH, Jr., Howard DV. Not just scenery: viewing nature pictures improves executive attention in older adults. *Exp Aging Res.* 2014;40(5):513-530.**
31. Faber Taylor A, Kuo FE. Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders.* 2009;12(5):402-409.
32. Bratman GN, Hamilton JP, Hahn KS, Daily GC, Gross JJ. Nature experience reduces rumination and subgenual prefrontal cortex activation. *Proc Natl Acad Sci U S A.* 2015;112(28):8567-8572.

33. Jansson M, Fors H, Lindgren T, Wiström B. Perceived personal safety in relation to urban woodland vegetation – A review. *Urban for. urban green*. 2013;12(2):127-133.
34. Li Q, Otsuka T, Kobayashi M, et al. **Acute effects of walking in forest environments on cardiovascular and metabolic parameters.** *Eur J Appl Physiol*. 2011;111(11):2845-2853.
35. Ward Thompson C, Roe J, Aspinall P, Mitchell R, Clow A, Miller D. More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. *Landscape and Urban Planning*. 2012;105(3):221-229.
36. Detweiler MB, Sharma T, Detweiler JG, et al. What is the evidence to support the use of therapeutic gardens for the elderly? *Psychiatry Investig*. 2012;9(2):100-110.

ADDITIONAL READING RECOMMENDATIONS:

1. Gruchalla RS, Pongracic J, Plaut M, et al. Inner City Asthma Study: Relationships among sensitivity, allergen exposure, and asthma morbidity. *J Allergy Clin Immunol*. 2005;115(3):478-485.
2. Freedman DM, Dosemeci M, McGlynn K. Sunlight and Mortality from Breast, Ovarian, Colon, Prostate, and Non-Melanoma Skin Cancer: A Composite Death Certificate Based Case-Control Study. *Occup Environ Med*. 2002;59(4):257-262.
3. Appleman K, Figueiro MG, Rea MS. Controlling light-dark exposure patterns rather than sleep schedules determines circadian phase. *Sleep Med*. 2013;14(5):456-461.
4. Kuo M. How might contact with nature promote human health? Promising mechanisms and a possible central pathway. *Front Psychol*. 2015;6:1093.
5. Wilson EO. *Biophilia*. Harvard University Press; 1984.
6. Kellert SR, Heerwagen J, Mador M. *Biophilic design: the theory, science and practice of bringing buildings to life*. John Wiley & Sons; 2008.
7. Heerwagen J. *Biophilia, health, and well-being. Restorative commons: creating health and well-being through urban landscapes*: U.S. Department of Agriculture, Forest Service, Northern Research Station; 2009:38-57.
8. Fjørtoft I. *Landscape as Playscape: The Effects of Natural Environments on Children's Play and Motor Development*. *Child Youth Environ*. 2004;14(2):21-44.
9. Ohtsuka Y, Yabunaka N, Takayama S. Shinrin-yoku (forest-air bathing and walking) effectively decreases blood glucose levels in diabetic patients. *Int J Biometeorol*. 1998;41(3):125-127