

4 May 2023

TO: Faculty Senate

FROM: Amy Lubitow, Chair, Graduate Council

RE: Graduate Certificate in Healthy and Efficient Buildings

The following proposal has been approved by the Graduate Council and is recommended for approval by the Faculty Senate.

You may read the full text of the program proposal, as well as Budget Committee comments, at the [Online Curriculum Management System \(OCMS\) Curriculum Dashboard](#)

**PROPOSAL SUMMARY FOR
Maseeh College of Engineering and Computer Science
Graduate Certificate in Healthy and Efficient Buildings**

Certificate Type

Graduate certificate: Admission to graduate status required

Effective Term

Fall 2024

Overview of the Program

Humans are indoor creatures; we spend ~90% of our time indoors. Buildings also consume ~40% of the energy produced in the U.S. Despite these time and energy investments in our buildings, indoor environments are understudied relative to their impact on sustainability goals and our well-being. One reason for this disparity is that the connections between building design and operation, building energy use, indoor air pollution exposures, and health are only recently being discovered and acknowledged. As a result, there is a deficit of qualified engineers and scientists equipped with the skills to understand buildings as a complex system of interactions between humans, building mechanical and structural systems, and city-scale infrastructure.

The proposed certificate aims to develop students' engineering expertise in building science related to building mechanical systems, energy consumption, and indoor air quality. Core courses in the certificate relate to fundamental heat transfer processes occurring in building systems, design and operation of building environmental systems, energy modeling of buildings, and fate and transport of air pollutants (including airborne pathogens, like viruses) in indoor environments. Optional courses leverage existing strengths across PSU to allow students to explore their interest in Healthy and Efficient Buildings over a wide variety of relevant domains.

Evidence of Need

Feedback from current and former students has identified a demand for a coherent program that articulates the MME department offerings in the field of building science. It is expected that a formal certificate denoting completion of this emergent area of importance will compel enrollment in this certificate. There is also stronger than average demand for this career path compared to others.

The SARS-CoV-2 pandemic has highlighted the need for attention to our nation's building stock and accelerated the demand for qualified building engineers to address ventilation, air cleaning, energy consumption, and mechanical systems in a wide variety of commercial and residential buildings.

Portland, OR is renowned across the nation as a hub for green development. The "green cities" sector is identified by the City's economic development agency, Prosper Portland, as a critical growth sector for the city. Prosper Portland has estimated the Green Cities sector accounts for 20,000 jobs in the Portland, OR metropolitan area, spread over 1000 firms. Green Cities jobs growth rate in Multnomah County have increased by 10%, in excess of the national growth rate of 4%. See <https://webuildgreencities.com/about/>

The job outlook for mechanical engineers from 2020-2030 is strong, including a growth of 7%, or 21,000 additional jobs (US, Department of Labor). Importantly, this career path has much higher than average median pay, of \$90,160 (US, Department of Labor). The Healthy Buildings certificate offers an opportunity to serve as an economic elevator to the students who participate in this program, offering an on-ramp into mechanical engineering related building science jobs or as a means of differentiating their knowledge and demonstrate specific expertise in the field of healthy buildings and building science. While construction starts may be impacted by COVID-19, it is worth noting that this certificate offers a novel pathway by which students may demonstrate unique expertise – that is, by focusing on the role of buildings to impact health. The health-related market in the U.S. is enormous – U.S. health care spending in 2019 was \$3.8 trillion (U.S. Centers for Medicare and Medicaid Services, National Health Expenditure Accounts). The health and wellness markets are projected to reach \$1.1 trillion by the year 2027. As the current pandemic and recurring wildfires has brought into sharp focus how buildings impact our exposures to pathogens and other toxic compounds, it can be expected that practitioners that are knowledge in the health-related impacts of buildings will realize outside employment potential in the building services sector.

Quotations from local firms in support of expanding building science offerings at Portland State can be found in the full proposal.

Course of Study

The Healthy and Efficient Buildings certificate is a 16-credit program. Courses span topics related to indoor air quality, building mechanical systems, and building energy modeling. Note that conversations have been initiated with departments/instructors of the "optional" listed courses and/or the catalog has been reviewed to ensure these courses are regularly offered in the 3-year course projection.

Courses **required** as part of certificate:

- ME 521: Heating, Ventilating, and Air Conditioning Design Fundamentals, 4 credits
- ME 522: Building Energy Use Modeling, 4 credits
- ME 561: Buildings and Health: Indoor air quality, 4 credits

Choose **one** of the following course options to complete the certificate:

- ME 524: HVAC System Design and Controls, 4 credits
- ME 548: Applied Computational Fluid Dynamics, 4 Credits
- CE 517: Timber Design, 4 credits
- GEOG 542: Sustainable Cities, 4 credits
- USP 569: Sustainable Cities and Regions, 4 credits
- ETM 568 Energy Technology Innovations, 4 credits
- ME 547 Transfer and Rate Processes, 4 credits