**FISCAL YEAR 2024**
**CAPITAL OUTLAY PROJECT REQUEST**

*Institution Name*: CENTRAL MICHIGAN UNIVERSITY
*Capital Outlay Code*: TBD
*Project Title:* BROOKS HALL RENOVATION
*Project Focus:* ✓Academic ✓ Research ✓ Administrative/Support
*Type of Project:* ✓ Renovation ☐ Addition ☐ New Construction
*Approximate Square Footage:* 128,000
*Total Estimated Cost:* $39,700,000
*Estimated Duration of Project:* Design: 9 months; Construction: 18 months
*Is the Five-Year Plan posted on the department/s public Internet site?* Yes
*Is the request project included in the Five-Year Capital Outlay Plan?* Yes

**Project Purpose**

Brooks Hall was constructed in 1964 as the primary location for Central Michigan University's science departments and programs. Since the building's original construction, the pedagogy, laboratory safety standards, and technological developments in science have drastically changed, and will continue to evolve in the future.

The proposed project will convert an existing, well-built 58-year-old facility into a modern, safe, energy-efficient facility that supports effective teaching, learning, and research in high-demand fields of science and engineering.

Brooks Hall does not meet today's requirements for teaching, learning, research, or laboratory safety in the sciences. Nor does it meet modern standards for energy efficiency. The proposed renovation of Brooks Hall will improve safety for building users, enhance energy efficiency, increase the amount of high-quality research and educational space, and provide a centralized location for the College of Science and Engineering's Student Success Center in the academic core of Central Michigan University's campus.

The project will include heating, ventilation, and air conditioning improvements, as well as modernization to enhance air quality and energy efficiency. These changes in air handling and exhaust will improve indoor air quality for students, faculty and staff learning and working in the facility.

CMU completed a space utilization study in 2021, which demonstrated that laboratory space for science, technology, and engineering is insufficient. The Brooks Hall renovation will address this requirement by upgrading the laboratory, teaching, and advising spaces to meet the modern educational mission in these fields. Students in science, technology, and engineering majors will be directly impacted, as will many other students who will fulfill their general science education requirements in Brooks Hall. The requested renovations will enable CMU to produce Michigan's workforce of tomorrow – a workforce prepared to design and build electric vehicles, help society adapt to changing weather patterns, provide effective healthcare to all citizens, ensure a clean water supply, and create new technologies that enhance the quality of life.

When renovated, Brooks Hall will house:

- Academic programs in astronomy, environmental engineering, environmental science, geology, meteorology, and neuroscience, as well as biology courses taken by students pursuing degrees in science and health professions and students completing general education requirements.
- Modernized instructional classrooms, instructional laboratories, research laboratories and support spaces including a new vivarium with bioexclusion zones to advance important activities in the programs listed above, with support for interdisciplinary programs, grants, and contract work.
- A new collaborative space called AML-CME, the Advanced Manufacturing Laboratory for the Central Michigan Economy, will enable the people and industries in the central part of the state to fully realize the promise of advanced manufacturing. Advanced manufacturing is characterized by the rapid translation of technology into the manufacturing enterprise, especially as encompassed in the principles of Industry 4.0 in which the cyber and physical worlds are more closely integrated (e.g., automation, control, robotics, augmented reality, machine learning, digital twinning). The AML-CME will not only support CMU's exciting new degree programs in computer science, data science, and engineering, but also will be a hub for workforce development in local industry through non-traditional upskilling and credentialing programs.
- A centralized Science and Engineering Student Success Center that will offer services including academic advising, tutoring, success coaching and career services. These proactive initiatives have been demonstrated to enhance students' academic success.
- Space for the Office of Laboratory and Field Safety, including a dedicated area for safe handling of chemical waste.

**Scope of the Project**

The scope of the proposed Brooks Hall Renovation will be the modernization of the 128,000 square foot facility to include updates and enhancements to provide:

- Instructional classrooms and laboratories used by all undergraduate students.
- Research laboratories and Lab Safety functions, including a centralized office and enhanced chemical waste storage and handling.
- A new collaborative space called AML-CME, the Advanced Manufacturing Laboratory for the Central Michigan Economy, will enable the people and industries in the central part of the state to fully realize the promise of advanced manufacturing.
- A centralized Student Success Center for the College of Science and Engineering.
- Updated infrastructure to ensure the current standards for building and laboratory mechanical, electrical, and plumbing systems are met.
- Replacement of existing infrastructure systems including replacement of interior lighting, secondary electrical distribution, domestic piping and sanitary systems and hydronic piping, pumps, and controls to support a new four pipe HVAC system.

Building envelope replacements and repairs including roofing and masonry, energy efficient windows and exterior doors. Interior finish replacements including ceilings, doors, and flooring.

- Additional renovations to ensure the facility meets current ADA standards and other best practices that are vital to the student experience including restroom upgrades, door and hardware replacement and elevator upgrades.
- Enhancing the technology in the instructional and research spaces.
- Historically, CMU has invested in maintaining the Brooks Hall infrastructure. The University will continue to ensure the building will meet the needs of today and tomorrow's students.

The Brooks Hall renovation project is to include new mechanical, electrical and/or plumbing infrastructure to support the new vivarium and the re-programmed research laboratories (including Rock Grinding, Chemical, Biology, and General Science Flexible Labs), and the Chemical Waste Storage Area. Additional infrastructure improvements in the project are to include new exterior windows, new exterior doors at the primary entrances, an elevator modernization, and an electrical generator replacement.

Proposed additional infrastructure modernization is to include installation of Direct Digital Controls; replacement of select dampers and ducts, Variable Air Ventilation (VAV) boxes, exhaust fans, heat pumps, heat exchange equipment, tanks, pumps, and valves; replacement of select chilled water piping and valves, replacement of select domestic piping, valves, and equipment; replacement of select sanitary and storm sewer piping.

**Program Focus of Occupants**

Upon the completion of the Brooks Hall Renovation project, the facility will accommodate:

- Academic programs in astronomy, environmental engineering, environmental science, geology, meteorology, and neuroscience, as well as biology courses taken by students pursuing degrees in science and health professions as well as students completing general education requirements.
- Modernized instructional classrooms, instructional laboratories, research laboratories and support spaces to advance important activities in the programs listed above, with support for interdisciplinary programs, grants, and contract work.
- A new collaborative space called AML-CME, the Advanced Manufacturing Laboratory for the Central Michigan Economy, will enable the people and industries in the central part of the state to fully realize the promise of advanced manufacturing. The AML-CME will not only support CMU's exciting new degree programs in computer science, data science, and engineering, but also be a hub for workforce development in local industry through non-traditional upskilling and credentialing programs.
- A centralized Science and Engineering Student Success Center that will offer services including academic advising, tutoring, success coaching and career services.
- Space for the Office of Laboratory and Field Safety, including a dedicated area for safe handling of chemical waste.

**How does the project support Michigan's talent enhancement, job creation and economic growth initiatives on a local, regional and/or statewide basis?**

Jobs in science related fields continue to grow, and students are increasingly interested in these programs. Science was cited as a primary area of interest by 37 percent of the CMU incoming freshman class, and most of those students will take classes in Brooks Hall. The renovated spaces will keep students excited and engaged, increasing retention and enrollment in science, technology, and engineering programs. Programs housed in Brooks Hall include astronomy, environmental engineering, environmental science, geology, and meteorology. Biology also has an essential presence in Brooks Hall that enables the teaching of foundational laboratory-based courses.

The above-mentioned academic programs located in Brooks Hall produce graduates who go directly into high-paying positions in fast-growing fields like the ones listed below (all data from the US Bureau of Labor Statistics - https://www.bls.gov/; current median value of annual salary; projected growth of job market over the period 2021-2031).

- Atmospheric Scientist (incl. Meteorologist): $94,570; 4 percent growth
- Biochemist: $102,270; 15 percent growth
- Geoscientist: $83,680; 5 percent growth
- Environmental Engineer: $96,820; 4 percent growth
- Environmental Scientist: $76,530; 5 percent growth
- Microbiologist: $79,260; 9 percent growth
- Physicists and Astronomers: $147,450; 8 percent growth

Furthermore, the academic programs in Brooks Hall provide the foundational science and technology courses for the following professions found on the list of Michigan's high-demand, high-wage jobs from the Bureau of Labor Market Information and Strategic Initiatives (all data from https://milmi.org/_docs/publications/CareerOutlook_Statewide_2030.pdf; hourly salary range; annual growth).

- Physician Assistants: $48-62/per hour; 31.9 percent growth
- Physical Therapists: $36-$48/per hour; 18.5 percent growth
- Nurse Practitioners: $48-$60/per hour; 50.7 percent growth
- Medical Scientist: $29-$50/per hour; 20.2 percent growth

The recent addition of an environmental engineering (ranked #6 in Best Engineering Jobs and #28 in Best STEM Jobs) program will benefit greatly from this project. The program is already producing graduates with in-demand skills, especially in water quality, waste management, and sustainability. On a national level, employment of environmental engineers is projected to grow 4 percent from 2021 to 2031. The growth rate in Michigan is currently outpacing the national average by about 50%. In addition, this program is expected to significantly increase the participation of women in engineering, a point of emphasis for the College of Science and Engineering. Moreover, even though environmental engineering is a very new program, all its faculty members were able to secure federal funding to undertake research to help protect the environment and quality of life in Michigan and beyond.

The Advanced Manufacturing Laboratory for the Central Michigan Economy (AML-CME) is a new addition to Brooks Hall, to be created during this renovation. The overall purpose of the AML-CME is to enable the people and industries in the central part of the state to fully realize the promise of advanced manufacturing. Advanced manufacturing is characterized by the rapid translation of technology into the manufacturing enterprise, especially as encompassed in the principles of Industry 4.0 in which the cyber and physical worlds are more closely integrated (e.g., automation, control, robotics, augmented reality, machine learning, digital twinning). The AML-CME will not only support CMU's exciting new degree programs in computer science, data science, and engineering, but also be a hub for workforce development in local industry through non-traditional upskilling and credentialing programs. The creation of the AML-CME increases the scope of the Brooks Hall renovation project to touch the following professions found on the list of Michigan's high-demand, high-wage jobs from the Bureau of Labor Market Information and Strategic Initiatives (all data from https://milmi.org/_docs/publications/CareerOutlook_Statewide_2030.pdf; hourly salary range; annual growth).

- Computer & Information Systems Managers: $49-$78/per hour; 7.6 percent growth
- Data Scientists & Mathematical Science Occupations: $30-$49/per hour; 29.4 percent growth
- Electrical Engineers: $37-$58/per hour; 8.2 percent growth
- Mechanical Engineers: $37-$49/per hour; 10.1 percent growth
- Software Developers & Quality Assurance Analysts: $37-$58; 22.8 percent growth

A renovated Brooks Hall also will be home to the College of Science and Engineering's Student Success Center. This center will be a high-profile space dedicated to undergraduate student success and achievement. Services provided include academic advising, career services, internship placements and tutoring. Time spent with advisors is proven to increase retention and persistence and gives students a focused plan for timely degree completion.

Additionally, a new collaborative workspace for students will be included in the project. Research clearly shows that engaged students are more likely to succeed in their studies. This has also been our experience at CMU with the Biosciences Building, whose modern design has been linked to higher academic success rates for students. This modernized and upgraded space in Brooks Hall will maximize student engagement with faculty and peers, expand active teaching and learning, and promote collaborative work. This activity is essential to preparing students for success in the professional world, while increasing performance outcomes such as retention and graduation.

CMU prides itself on serving the students, parents, and taxpayers of the state of Michigan. Nearly 91 percent of on-campus undergraduate students come from Michigan, sharing a natural and deep interest in serving the state's communities and residents. In fact, about 70 percent of CMU alumni — more than 145,000 — choose to live and work in the state, in turn improving lives, the economy and communities.

CMU has a robust Career Development Center that has built extensive relationships with employers across the state and supports the employment efforts of recent graduates as well as

alumni. Employers post more than 40,000 jobs a year through the university's Career Development Center.

**How does the project support core academic, development of critical skill degrees, and/or research mission of CMU?**

This project request focuses on enhancing the core academic and research missions of CMU.

*Academic Programs:* The Brooks Hall renovation will provide a modern facility for students in many fields of science. Thirty-seven percent of CMU new, first year students cite science as a primary area of interest. The enhanced and modernized classrooms and laboratories will foster innovative teaching and learning in environmental engineering, environmental science, meteorology, astronomy, geology, and neuroscience, in addition to biology. The proposed addition of the Advanced Manufacturing Laboratory for the Central Michigan Economy (AML-CME) during the Brooks Hall renovation will enable new programs in cybersecurity and data science (started fall 2022), as well as five existing engineering and technology programs. The nature of the AML-CME promotes collaboration with local industry, enabling new programs in the non-traditional credit space (badges, micro credentials, upskilling) through CMU's Innovation & Online unit.

The AML-CME will be equipped with the latest technology in targeted areas. Specific items include: two 3D metal printers, one of the more established selective-laser-melting type and the other of the novel cold-spray type; a desktop CT scanner that analyzes 3D printed parts to verify tolerances and integrity of inner volumes, making it useful for quality control and researching new printing processes; a major upgrade to the CMU robotics laboratory, including the purchase of two "cobot" (lightweight robot) arm devices for automated manufacturing; a dedicated machine learning cluster to serve the robotics laboratory and cybersecurity projects; three educational units in the areas of hydraulic power and electric motors; and a standalone system of wireless network and switches, used for embedded systems, Internet of Things (IOT) components, and digital systems. Renovation of Brooks Hall is necessary for the installation of the AML-CME, as the facility will not support such equipment in its current state. We expect to triple our level of engagement (internships, jobs, student, and faculty projects, etc.) with regional industry through this state-of-the-art facility.

*Critical Skills:* CMU is a major contributor to meeting the State of Michigan's goals of critical skills education. During FY22, CMU conferred 1,220 degrees to students graduating with majors in critical skills programs. Furthermore, CMU's fall term 2021 headcount enrollment included 3,671 students with authorized majors in critical skills areas and another 1,416 students who plan to major in critical skills fields such as biological and biomedical sciences, computer information systems, engineering, engineering technology, health professions, mathematics and statistics, natural resources and conservation, physical sciences, and science technologies.

Critical skills programs tend to be some of the most intellectually challenging majors on campus. As such, significant academic advising, and support are needed to ensure that we are recruiting and retaining students in these fields. The renovation includes the creation of a dedicated location for the College of Science and Engineering Student Success Center that will house academic advisors as well as space for tutoring and career services. In addition, spaces for

students to study and collaborate will be incorporated throughout the building to enhance its academic character and appeal to students. These features will help with recruiting students to STEM disciplines at CMU and enhancing their academic success.

*Student Success:* The renovation includes the creation of a dedicated location for the College of Science and Engineering Student Success Center that will house academic advisors as well as space for tutoring and career services. In addition, spaces for students to study and collaborate will be incorporated throughout the building to enhance its academic character and appeal to students. These features will help recruit students to STEM disciplines at CMU and enhance their academic success.

*Research:* The renovation will enhance research laboratories in environmental science and engineering. Importantly, it also includes a bioexclusion zone vivarium to support critical research in neuroscience and biomedical sciences. This type of vivarium provides greater efficiency in research and mitigates the possibility of exposing animals to other contaminants during research studies. Research performed in the current facilities is limited because CMU does not have such a vivarium. These enhancements will increase opportunities for student research as well. Unlike many research universities, CMU is committed to providing opportunities for undergraduate students to engage in original research with faculty mentors. In the last three years, more than 600 science and engineering undergraduate students participated in faculty-led research projects and nearly 100 of those students were co-authors on published scientific papers.

The proposed facility will foster greater collaboration among faculty, staff, students, and community partners. Early interdisciplinary research in the classroom often burgeons into student opportunities serving around the state, partnering in field work with the Great Lakes Restoration Initiative to advance important research on the health of plants, animals, and water quality in approximately 1,000 Great Lakes coastal wetlands. Hundreds of governmental and environmental groups in the United States and Canada have requested data from the wetlands monitoring program. Students, through a strong academic foundation built with faculty and peers in the courses and labs in Brooks Hall, can build advanced experiences and will go on to be the next generation of scientists, engineers, and health professionals. The ability to offer students these types of experiences fulfill CMU's mission of fostering personal and intellectual growth to prepare students for productive careers, meaningful lives, and responsible citizenship in a global society.

**Is the requested project focused on a single, stand-alone facility? If no, please explain.**

Yes, the Brooks Hall Renovation project is a stand-alone facility.

**How does the project support investment in or adaptive re-purposing of existing facilities and infrastructure?**

This renovation will become a showcase facility for all CMU students, while keeping fiscal responsibility of finite State and University resources at the forefront of decision making. This project will revitalize a structurally sound 58-year-old building, completing the modernization of its infrastructure and support systems. This renovation will improve the environmental quality of

the building and increase the energy efficiency of systems. The renovation will enhance laboratory safety, including chemical waste handling.

The overall goal is to enhance the space to meet the needs of students and researchers today and in the future. The skills students attain in Brooks Hall are the foundation of their academic knowledge in many fields of science. Their time spent in Brooks Hall plays a critical role in helping them grow personally and intellectually as they decide on a career path, often in science, medicine, and other health professions.

The renovation will far better utilize the existing space. Master planning efforts identified efficiencies to be gained in this building, while also allowing for better laboratory space with cutting-edge technology critical for scientific research, as well as support space for students, researchers, and academic programs. This renovated facility also will allow for a centralized bioexclusion zone vivarium for research in medicine and neuroscience.

**Does the project address or mitigate any current health/safety deficiencies relative to existing facilities?**

Yes. A key component of the Brooks Hall renovation will be the enhancement of safety in the existing facilities. The current building was constructed in 1964 and the laboratory space was built to meet standards of that era. Modern design processes will eliminate inefficiencies in the building's mechanical systems and implement optimal improvements. The facility will meet increasingly stringent regulations, including those for expanded ADA compliance. Infrastructure upgrades will include all necessary environmental work.

The Brooks Hall renovation will also enhance the ability to more safely process chemical and hazardous waste for disposal. Currently, this activity is carried out in the chemistry stockroom, which has a very small hood and limited bench space. A suitable dedicated room for waste processing will isolate activity away from the current preparation and chemical storage areas, which have a high degree of daily foot traffic.

**How does CMU measure utilization of its existing facilities, and how does it compare relative to established benchmarks for educational facilities? How does the project help to improve the utilization of existing space and infrastructure, or conversely how does current utilization support the need for additional space and infrastructure?**

CMU completed a space utilization study in 2021, which demonstrated that laboratory space for the sciences is insufficient. The Brooks Hall renovation will address this requirement, including the need for undergraduates, as it houses the biology courses taken by first year students studying sciences and students taking science courses as part of their general education requirements, as well as for students pursuing degrees in science and/or health professions. An updated Brooks Hall will be better equipped to engage and foster the science majors and health professionals of tomorrow.

**How does CMU intend to integrate sustainable design principles to enhance the efficiency and operations of the facility?**

The project will be built utilizing design standards that incorporate sustainable technology and practices ensuring that proven energy and environmental improvements will be implemented across all aspects of the design and construction of this project.

Primary components of sustainable design for the Brooks Hall Renovation project include:

- Energy recovery will be implemented resulting in significant energy savings over the existing hoods, which currently operate on individualized fans with 100 percent outside air.
- Controls upgrade resulting in improved operations, occupant comfort, the ability to schedule spaces and improved energy control.
- Upgraded lighting controls throughout the facility, including areas such as classrooms and offices. In addition, new lighting controls for common spaces such as hallways.
- The addition of LED lighting in key locations throughout the building.
- Installation of high-performance glass on external windows, replacing the current single-pane windows.
- Enhanced commissioning is a standard practice for CMU.
- Sustainable design principles will be used in the design and construction of the project. The project will be reported and measured using the LEED Green Building Rating System, in accordance with the DTMB Capital Outlay Design Manual.

**Are matching resources currently available for the project? If yes, what is the source of the matching resources? If no, identify the intended source and the estimated timeline for securing said resources.**

Yes, CMU plans to use available university construction reserves for this project. CMU is also working to secure additional private/foundation gifts and industry partners to offset the construction costs of the renovation, which is one of the university's master plan priorities. CMU is committed to this project and looks forward to working with the state to provide our students with modernized facilities to enhance their opportunities for success in high demand fields of science and engineering, while also fulfilling employer needs across the state.

**If authorized for construction, the State typically provides a maximum of 75% of the total cost for university projects. Does the institution intend to commit additional resources that would reduce the State share from the amounts indicated?**

CMU will provide the 25 percent match and fund all non-allowable costs associated with the project.

**Will the completed project increase operating costs to CMU?**

The proposed Brooks Hall renovation project will not increase operating costs for Central Michigan University. The project goal is that CMU will be able to lower operating costs for the building through sustainable design, LEED practices, and sound engineering principles such as energy recovery and control improvements.

**What impact, if any, will the project have on tuition costs?**

There will be no impact to tuition costs at Central Michigan University related to the renovation of Brooks Hall.

**If this project is not authorized, what are the impacts to the institution and its students?**

This project is essential to the continued success of CMU students, faculty and staff who utilize Brooks Hall. The current, outdated spaces of this facility are heavily utilized, but faculty and student research are limited by the capabilities of the current facility, and by the high demand of other similar facilities on campus.

This project is critically important to enhance the space to meet the needs of students today and in the future. Without this renovation, research, and laboratory space (including vivarium space) will continue to be limited, minimizing student and faculty research. In addition, the ability to expand program offerings in the fields of environmental engineering and medical related fields will be limited and strained for the necessary space to provide instructional and research opportunities.

To continue to be competitive in the higher education marketplace, CMU must continue to evolve its facilities to attract students and provide them with high-level educational opportunities. These students are looking for not only state-of-the-art facilities and technology, but also research opportunities they cannot find elsewhere.

**What alternatives to this project were considered? Why is the project preferable to those alternatives?**

In December 2021, the CMU Board of Trustees approved a 10-year campus master plan and capital projects list following an extensive, campus wide review of options and alternatives. The 10-year list was developed by a cross-campus team of faculty and staff based on input from many on-campus and community stakeholders.

The Brooks Hall renovation is a top priority on that list, based on safety needs, student demand, laboratory usage, scholarly research opportunities and state needs. Thirty-seven percent of CMU new, first year students cite science as a primary area of interest. This project was chosen due to student demand and the extensive need to update the facility to meet the learning space requirements of students today and in the future.

Several other projects were considered including the renovation of Pearce Hall, which opened in 1967. Pearce Hall serves many students in their first two years of coursework and is the home of programs such as mathematics, computer science, and world languages and cultures. While both facilities need substantial renovations, Brooks Hall was chosen due to high demand in the sciences, significant research opportunities that are limited by the availability and quality of laboratory space, and the job demands of employers. As such, this proposed capital outlay project will further Central’s and Michigan’s leadership in the sciences.