Architecture Program Report-Candidacy

Institution:
Worcester Polytechnic Institute

Date:
April 23, 2024

NAAB

National
Architectural
Accrediting
Board, Inc.

Architecture Program Report-Candidacy (APR-C)

2020 Conditions for Accreditation
2020 Procedures for Accreditation

Institution	
Name of Academic Unit	
Degree(s) *(check all that apply)* **Track(s)** *(Please include all tracks offered by the program under the respective degree, including total number of credits. Examples:* *150 semester undergraduate credit hours* *Undergraduate degree with architecture major + 60 graduate semester credit hours* *Undergraduate degree with non-architecture major + 90 graduate semester credit hours)*	☐ <u>Bachelor of Architecture</u> Track: ☒ <u>Master of Architecture</u> Track: 30 graduate credit hours M. Arch with 141 credit hours Bachelor of Science in Architectural Engineering for 171 credit hours total minimum. Track: ☐ <u>Doctor of Architecture</u> Track: Track:
Application for Accreditation	**Initial Candidacy**
Year of Previous Visit	2023 (eligibility visit)
Current Term of Accreditation *(refer to most recent decision letter)*	Eligibility
Program Administrator	Prof. Steven Van Dessel, PhD, Assoc AIA
Chief Administrator for the academic unit in which the program is located *(e.g., dean or department chair)*	Prof. Carrick Eggleston, CEAE Department Head
Chief Academic Officer of the Institution	Art Heinricher, PhD (interim Provost)
President of the Institution	Grace Wang, PhD
Individual submitting the APR	Prof. Steven Van Dessel, PhD, Assoc AIA
Name and email address of individual to whom questions should be directed	Prof. Steven Van Dessel, PhD, Assoc AIA svandessel@wpi.edu

Submission Requirements:
- The APR-C must be submitted as one PDF document, with supporting materials
- The APR-C must not exceed 20 MB and 150 pages
- The APR-C template document shall not be reformatted

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<u>INSTRUCTIONS FOR APR-C</u>

Initial Candidacy
The APR-C for initial candidacy must include the following appendices:
- the Plan for Achieving Initial Accreditation (documenting the program's progress)
- the eligibility memorandum

Continuation of Candidacy
The APR-C for continuation of candidacy must include the following appendices:
- the previous VTR
- the Plan for Achieving Initial Accreditation (documenting the program's progress)
- the eligibility memorandum

Instructions for the preparation, format, and submittal of the APR-C are published in the "Guidelines to the Accreditation Process."

<u>INTRODUCTION</u>

Progress since the Previous Visit (limit 5 pages)

In this Introduction to the APR, the program must document all actions taken since the previous visit to address Conditions Not Met and Causes of Concern cited in the most recent VTR.

The APR must include the exact text quoted from the previous VTR, as well as the summary of activities.

Program Response:

Not applicable

Program Changes

Further, if the Accreditation Conditions have changed since the previous visit, the APR must include a brief description of changes made to the program as a result of changes in the Conditions.

This section is limited to 5 pages, total.

Program Response:

Not applicable

NARRATIVE TEMPLATE

1—Context and Mission

To help the NAAB and the visiting team understand the specific circumstances of the school, the program must describe the following:

The institutional context and geographic setting (public or private, urban or rural, size, etc.), and how the program's mission and culture influence its architecture pedagogy and impact its development. Programs that exist within a larger educational institution must also describe the mission of the college or university and how that shapes or influences the program.

Program must specify their delivery format (virtual/on-campus).

Program Response:

Worcester Polytechnic Institute (WPI) is the nation's third-oldest private technological university. WPI is set in an urban environment in Worcester MA, New England's second largest city. WPI's main 80-acre campus is privately owned, ungated, and uninterrupted by public roads. The campus sits on Boynton Hill, apart from the adjacent neighborhood, which includes restaurants and stores on Highland Street. The campus is flanked by Institute Park on the north. Elm Park, designed by the Olmsted Brothers, is located south of campus and is within walking distance. In 2022 the institute included 4177 undergraduates, 1962 postgraduate students, and 478 academic staff.

WPI, a global leader in project-based learning, is a distinctive, top-tier technological university founded in 1865 on the principle that students learn most effectively by applying the theory learned in the classroom to the practice of solving real-world problems. Today, WPI recognizes the essential nature of preparing and supporting future scientists, engineers, designers, and business leaders in their journeys to become the empathetic, collaborative, and resourceful STEM professionals the world needs now.

WPI's award-winning, project-based and globally engaged curriculum engages students in solving important scientific, technological, and societal problems throughout their education—on campus and at more than 50 project centers in the Americas, Africa, Asia-Pacific, and Europe. In both academics and research, undergraduate and graduate students pursue interdisciplinary collaboration with each other, with faculty across WPI's four schools, and with public and private partners to develop broad-scope solutions to socially relevant problems.

WPI offers a variety of majors in engineering, science, architecture, management, liberal arts, and social science at the undergraduate and graduate level. It is most well-known for its engineering disciplines and is one of the top-ranked engineering schools in North America. More than 70 PhD, master's, bachelor's, and certificate programs are offered both on campus and online, providing flexible options and opportunities for students to advance their careers and succeed in today's—and tomorrow's—world.

WPI's undergrad schedule is unusual compared to most universities. Instead of a normal semester, WPI has 7-week terms, labeled A through D, with optional E Terms in the summer. Students typically take three courses during each term, which allows students to complete a year's worth of Chemistry, Physics, Mathematics, etc. in only one semester. This faster pace allows for students to take more courses to substantiate their diploma. The graduate student calendar follows a mixed schedule of conventional two semester classes and traditional 7-week courses.

WPI's curriculum is focused on project-based learning, an emphasis established in 1970 as part of what was called the WPI Plan. This allows for a student to learn theory and practices concurrently. This approach includes an Interactive Qualifying Project (IQP) to study the social effects of technology collaboratively with students from other disciplines and a Major Qualifying Project

(MQP) that falls within the student's discipline. Usually, the IQP and MQP are completed in the junior and senior years, respectively.

Students can also complete a Great problem Seminar (GPS), a two-term course that immerses first-year students into university-level research and introduces them to the project-based curriculum at WPI. As part of the Global School at WPI, the course gives students and faculty the opportunity to step outside their disciplines to solve problems focused on themes of global importance.

At WPI, the opportunity to complete significant project work off campus is an integral element of an academic program that emphasizes the practical application of knowledge to meaningful technical and societal problems. As of the class of 2022, all first-year students receive a global project scholarship of up to $5,000 for this work. Through the Global Projects Program, over 60% of WPI students complete at least one of their required projects at an off-campus Project Center. Typically, students work under faculty guidance in small teams at Project Centers to address problems posed by external agencies and organizations.

Through the Global Projects Program, WPI sends more students abroad than any US college or university. As of the 2019–2020 academic year, the program included over 50 Project Centers spanning 6 continents. Between 1974, when the first WPI Project Center was established in Washington, DC, and 2014, over 7,000 students have completed over 2,000 projects in locations around the globe. The Global Projects Program was cited by the Association of American Colleges and Universities in 2000, when it named WPI one of its 16 Greater Expectations Leadership Institutions to serve as models for the future of undergraduate education in the United States.

WPI's Mission
WPI transforms lives, turns knowledge into action to confront global challenges, and revolutionizes STEM through distinctive and inclusive education, projects, and research. (Adopted by the Board of Trustees, October 29, 2021)

WPI's Core Values

Respect: We treat others with dignity at all times. We embrace expertise, including that earned through both education and lived experience. As global citizens, we respect our natural environment and acknowledge the responsibility we all have to develop and disseminate sustainable stewardship practices for our planet. We are committed to building a workplace and a campus where all can contribute, where all voices are valued, and where we engage and communicate with care and professionalism.

Community: We work from a collective vision and purpose to break down barriers to advancing our mission. We embrace opportunities to work collaboratively across disciplines, backgrounds, and organizations to craft better solutions to global and local challenges. We engage diverse perspectives to advance the university to greater heights. We embrace a true spirit of partnership to advance our shared mission, actively seeking partners across our campus and beyond as we commit to elevate our impact.

Inclusion: We seek a campus where everyone feels a sense of belonging and all can thrive. We respect differences and the complex identities of each member of our community. We are courageous in our efforts to reduce systemic barriers to success for minoritized groups. We promote and support diversity while actively working to advance equity on our campus and beyond.

Innovation: We commit to creating value in all that we do. We approach challenges with the creativity and resilience to make change where it is needed. We act as catalysts to make the world better. We embrace and celebrate learning for all. We act ethically, recognizing how innovation

affects different populations by creating learning environments that reflect a broad diversity of experience, perspective, and identities.

Achievement: We are intentional in creating great experiences and results for all students, while embracing the importance of balance and well-being. We are outcomes-focused and are committed to creating positive societal change through our work. We tackle the world's great problems with innovative solutions born of diverse perspectives. We recognize and celebrate successes and proudly learn from failures

The program's role in and relationship to its academic context and university community, including how the program benefits–and benefits from–its institutional setting and how the program as a unit and/or its individual faculty members participate in university-wide initiatives and the university's academic plan. Also describe how the program, as a unit, develops multidisciplinary relationships and leverages unique opportunities in the institution and the community.

Program Response:
Within the school of Engineering, the Master of Architecture program is positioned alongside the existing Architectural Engineering (AREN) program in the Department of Civil, Environmental, and Architectural Engineering. WPI's existing Architectural Engineering program focuses on the science and engineering aspects of building design, preparing engineering graduates for careers in the building professions. Drawing on WPI's unique strength in project-based education, the AREN program provides a strong education in the fundamentals of the building sciences. WPI's Architectural Engineering program is one of only a few ABET accredited architectural engineering programs in the U.S. and the only one in New England. One of the unique features of the AREN program at WPI is its focus on an integrated studio curriculum, which emphasizes development of design skills that integrate architectural and engineering thinking throughout the design process. It is out of this existing program that the new Architecture program is growing, and the curriculum of both programs is highly integrated and aligned.

The new M. Arch program will also benefit substantially from WPI's project-based curriculum and opportunities at the undergraduate level. At WPI, all undergraduate students are required to complete the Interactive Qualifying Project (IQP) to study the social effects of technology collaboratively with students from other disciplines. The IQP offers a framework for design studies that center on societal effects of architectural and urban interventions. Many of the IQP's are held in over 50 off-campus project centers, most of which are abroad. These venues provide exceptional opportunities for students studying architecture to get meaningful exposure to other cultural and environmental contexts. Likewise, the Great problem Seminar (GPS) offers great opportunities that immerses first-year students into university-level research and introduces them to the project-based curriculum at WPI. Many Faculty associated with the Master of Architecture program already assume active roles in IQP and GPS courses at WPI, which facilitates the integration of these existing curricular requirements with the new M. Arch. program.

As a polytechnic institution, WPI is ideally positioned to offer a program that combines engineering and architecture, which is the foremost distinguishing feature of the new program. Within the "polytechnic" tradition, the program is anticipated to develop a culture with focus on design creativity that is underpinned by knowledge of the building sciences. Within the integrated 5-year program (4-year BS in Architectural Engineering + 1 year M. Arch.) it is our intention that students gain accredited degrees in both architecture (NAAB) and engineering (ABET).

The construction, operation, maintenance, and decommissioning of buildings has global impact and consequences, especially within the context of climate adaptation. The main goal of our program is to educate the next generation of designers who will create the sustainable built environment of tomorrow. To address global grand challenges, the program also collaborates closely with WPI's Global School through IQP's and GPS courses at the undergraduate level, and

with the Community Climate Adaptation (CCA) program at the graduate level. Climate Adaptation is one of the focus areas of the new M. Arch program, with students completing coursework alongside CCA graduate students. The CCA program is co-directed between faculty at the Global School and the Department of Civil, Environmental, and Architectural Engineering, which facilitates integration with the new M. Arch program.

The M. Arch program brings together faculty from across campus from multiple architectural sub-disciplines and areas of specialization. These subdisciplines include such areas as engineering and architectural design, historical preservation, urban design and planning, sustainability, development, social sciences and policy studies, design for climate adaptation, and history and theory of architecture. Faculty across the university will offer a wide range of courses seminal to the discourse of architecture and will support M. Arch students as co-advisors for thesis concentration areas. These collaborations will create a multi-disciplinary / cross-disciplinary environment that brings together faculty in engineering, architecture, arts and humanities, the social sciences, and the global school. Faculty primarily associated with the AREN program already collaborate in capstone projects with colleagues in these allied fields. We anticipate that the increased collaboration to deliver the program will also enhance our collective capacity to pursue research at the nexus of architecture, engineering, and urban planning to address grand challenges related to such critical areas as climate change and social and environmental justice.

The ways in which the program encourages students and faculty to learn both inside and outside the classroom through individual and collective opportunities (e.g., field trips, participation in professional societies and organizations, honor societies, and other program-specific or campus-wide and community-wide activities).

Program Response:

The program will be offered at the WPI campus in Worcester MA relying primarily on traditional on-campus lecture and studio teaching formats, with students working with faculty advisors to guide thesis work. A dedicated study abroad studio experience is being considered in partnership with the Polytechnic of Milan (piloted in the 22-23 academic year), and the University of Panama (planned for Spring 2025). The WPI curriculum overall also provides exceptional opportunities to students to learn outside classroom settings. This is most evident in the institute-wide Interactive Qualifying Project (IQP) requirement, which most often involves travel abroad and collaboration with non-academic partners. The major capstone design projects are occasionally also in collaboration with external partners. The program and institution also have strong ties to the local community and the city of Worcester. For example, faculty and students have delivered pro-bono design services for the city which resulted in several built projects. Students and faculty have collaborated with the local public school district on various occasions, including mentorship programs and participation of local technical schools in solar decathlon competition projects. The AREN program also has an industry advisory board composed of local practitioners, and we aim at leveraging these connections to benefit students in the Master of Architecture program. The AREN program has an active student chapter of the Architectural Engineering institute (AEI), and several students in the program attend the annual conference with faculty each year. The program has a lecture series that exposes students to various aspects and forms of practice. Our "Day in Practice" program, which was initiated last academic year, allows students to spend a full day at one architectural, engineering, or contracting firm to learn about their practice.

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Summary Statement of 1 – Context and Mission
This paragraph will be included in the VTR; limit to maximum 250 words.

Program Response:
The Master of Architecture program at WPI is uniquely positioned within the interdisciplinary framework of our university, bridging the traditional boundaries of architectural education with engineering science, and technology. With a strong emphasis on project-based learning, our curriculum integrates real-world problem solving with rigorous academic studies, preparing students to excel as professionals who contribute to and care for their communities and the environment.

The recent expansion of our academic offerings to include a unique integration of Architectural Engineering and Master of Architecture degrees is a response to the growing demand for architects and engineers who are both technically proficient and socially responsible. This enhancement has been instrumental in redefining our educational approach, ensuring our graduates possess not only technical proficiency but also a deep understanding of the social and environmental impacts of architectural practices. Our program fosters a culture of innovation, collaboration, and responsibility, which is crucial for promoting sustainable and inclusive development.

Located in the heart of New England's vibrant architectural landscape, our program benefits immensely from its close ties to local industries and extensive global networks. These connections enrich our research and educational output, establishing our institution as a leader in sustainable architectural design and building engineering education. Through collaborative projects at both local and international levels, our students and faculty address pressing issues such as climate adaptation, urban resilience, and community engagement.

2—Shared Values of the Discipline and Profession

The program must report on how it responds to the following values, all of which affect the education and development of architects. The response to each value must also identify how the program will continue to address these values as part of its long-range planning. These values are foundational, not exhaustive.

Design: Architects design better, safer, more equitable, resilient, and sustainable built environments. Design thinking and integrated design solutions are hallmarks of architecture education, the discipline, and the profession.

Program Response:

The program embraces a culture of engaged citizenship, collaboration, ability to align technical competence with design intent and artistry, and the embracing of design-thinking and integrated design solutions as a tangible means of making meaningful contributions to society and the environment. This culture is reinforced and maintained within several elements of the program curriculum, research, and professional practice.

Program curriculum.
For students, this culture is most directly experienced within the design sequence, which is characterized by collaborative and collegial design experiences that promote integrative design thinking through integration of technical and non-technical requirements and considerations. The sequence starts in the second year of the program with 3 foundational studios that focus on different aspects of design, including a focus on tools and representation techniques (studio 1), light in architecture and lighting systems (studio 2), and structure (studio 3). In the third-year students complete two advanced design studios that focus on integrating energy modeling techniques within the design process (studio 4) and developing building enclosure detailing and design development skills (studio 5). All studios provide hands-on experience in addressing real-world challenges with the focus on sustainable design practices, social equity, and resilience. They incorporate advanced digital tools and simulation software to prepare students to lead in the adoption of innovative design practices. The studios entail a collaboration between students and multiple faculty members with complementary backgrounds in engineering and architecture. About ¼ of total studio time (3 out of 12 hours a week) is dedicated to lectures on technical topics that cover engineering science fundamentals. Studio projects gradually increase in scope and complexity throughout the sequence, and tackle design challenges in urban and non-urban settings.

In the third year of the program students complete their interactive qualifying project (IQP), a project at the interface between society and technology. In this project students collaborate with students from other majors and are advised by faculty members with diverse backgrounds. While the IQPs are not intended to tackle architectural design challenges directly, the experience offers a powerful mechanism to build a spirit of engaged citizenship by working collaborative with other majors and non-academic partners on grand challenges, which strengthens and diversifies a student's design thinking process.

In the fourth year the sequence continues with the Major Qualifying Project (MQP), a year-long capstone design experience required for all WPI students and majors (requiring work equivalent to 3 courses). The MQP is a collaborative capstone design experience that integrates technical requirements with architectural design. MQP projects are advised on a team basis by faculty members with complementary backgrounds in engineering and architecture, which builds a collaborative spirit between these allied disciplines.

In the fifth year, students complete most of the graduate courses and the required graduate design thesis. The Master of Architecture program requires a minimum of 30 semester credit

hours of graduate coursework. The curriculum is composed of 2 professional practice courses (6 credits), a thesis research seminar (3 credits), 3 focus area courses (9 credits), and a design thesis (12 credits), as shown in table 1 below.

Table 1. Master of Architecture Graduate Course Requirements / Design			Graduate Credit Hours
Research Seminar	New course	Thesis Research seminar	3
Professional Practice	CE 501	Professional Practice	3
		Professional practice elective	3
Focus Area Electives		Elective	3
		Elective	3
		Elective	3
Design Thesis	new Course	Design Thesis	12
Minimum semester credits hours of graduate coursework			30

•Thesis Research Seminar (3 credits) This seminar prepares students to conceive and develop a graduate thesis project proposal that is rooted in the originality and innovation of research and design practice. The course is structured with seminars of invited speakers, discussions of readings, workshops, student presentations, and thesis proposal development. The seminar may include a travel component. The topics vary each year with the focus on research methodologies and broad issues relevant to the discipline of architecture.

• Professional Practice Courses (6 credits)
CE 501. Professional Practice (required – 3 credits)
CE 580. Advanced Project Management (elective)
CE 584. Advanced Cost Estimating Procedures (elective)
CE 583. Contracts and Law for Civil Engineers (elective)

•Design Thesis (12 credits) The graduate design thesis involves creating and advancing a comprehensive architectural project that exhibits adequate scope and intricacy. Thesis design topics are developed in close collaboration with a thesis committee, which is composed of a primary thesis advisor and an advisor in a focus area. A formal thesis rational and plan is developed during the thesis research seminar. The design thesis is required of all graduate students in the Master of Architecture program. Students register for 6 credits during the fall semester and 6 credits during the spring semester of their master's year.

•Focus area (9 credits) The design thesis is underpinned by elective courses that are thematically aligned with a focus area, allowing students to broaden their skills and develop a meaningful grasp of a thematic area of interest. To ensure this depth, students complete at least three courses of thematically related work. Different focus areas are possible and currently include a focus on (1) structures, and (2) climate adaptation. Other focus areas can be developed, and students can propose alternative thematically related coursework with sponsorship from a thesis advisor and approval of the M. Arch program committee. The focus area is seen as an important mechanism to connect the graduate program with faculty from other research domains and programs across campus. A list of recommended courses for two exemplary focus areas is included below:

Focus area – Structures.
CE 524: Finite Element Method and Applications CE 510: Structural Mechanics
CE 511: Structural Dynamics
CE 514/ME 5383: Continuum Mechanics CE 519: Advanced Structural Analysis
CE 531: Advanced Design of Steel Structures

CE 532: Advanced Design of Reinforced Concrete Structures
CE 534: Structural Design for Fire Conditions
CE/ME 5303: Applied Finite Element Methods in Engineering

Focus area – Climate Adaptation.
IGS 501: Theorizing Place, Community, and Global Environmental Change
IGS 505: Qualitative Methods for Community-Engaged Research
IGS 510: Human Dimensions of Global Environmental Change
IGS 545: Climate Change: Vulnerability and Mitigation
IGS 590: Capstone Seminar: Comparative Climate Action

The 5th year provides a broad context for design and experimentation that is underpinned by supporting coursework.

The program's physical studio environment also plays an important role in establishing a culture of engagement and positive collaboration. Beyond the design sequence, design thinking and engaged citizenship are also advanced through our guest lecture series, and through internships, which are strongly encouraged by the program.

Assessment:
The curricular and non-curricular elements in which this shared value is covered are indicated more specifically in the PC/SC matrix, included on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development). In the long-range planning, we engage in annual program evaluations to assess our progress and identify areas for improvement by working with the program advisory board, alumni, students, and others.

Environmental Stewardship and Professional Responsibility: Architects are responsible for the impact of their work on the natural world and on public health, safety, and welfare. As professionals and designers of the built environment, we embrace these responsibilities and act ethically to accomplish them.

Program Response:
Stewardship of our environment and professional responsibility are foundational principles for the program. The program's curriculum is integrated, for the first 4 years, with the curriculum of the existing Architectural Engineering program. Providing these ties, the program abides to the code of ethics for engineers to "hold paramount the safety, health, and welfare of the public". We take this to include environmental responsibility and climate action. Likewise, we also subscribe to the general code of ethics of the AIA which requires members to "recognize and acknowledge the professional responsibilities they have to promote sustainable design and development in the natural and built environments and to implement energy and resource conscious design". This is a key point – buildings and the build environment are responsible for a large proportion of human greenhouse gas emissions, and changing this starts with Architects and Engineers and with how we view the built environment as part of natural systems.

A culture of environmental stewardship and professional responsibility permeates through the program and curriculum. In courses, we stress the importance of ethics in the professional practice courses where we include environmental stewardship, public health, safety and welfare as ethical issues. In technical coursework, environmental principles are seminal to areas such as building system design and energy modeling courses. In these parts of the curriculum students attain a strong foundation in engineering science principles and tools that allow for evidence-based decision making in design projects. The studio environment furthermore reinforces the need to train emerging professionals to act responsibly and collaboratively towards the design of buildings that do not harm the environment and human

health and well-being. Studio assignments stress these requirements and entail a design process that considers the environmental impact of design interventions. The program also requires that a student completes optional courses in topics related to the history and theory of architecture and urban planning, design, and social and environmental justice - understood to include topics on environmental stewardship. At the graduate level this culture becomes most evident in thesis design work in which multi-dimensional criteria are used for evaluation work, including environmental stewardship, public health, safety, and welfare.

The program guest lecture series is also an important element of reinforcing a culture of professional responsibility and empowerment, and many of our guest lecturers speak to the importance of environmental responsibility, professionalism, and ethics. In addition, the program places a strong emphasis on real-world experiences through IQP and MQP projects that offer students the chance to apply their knowledge in contexts that demand a balance between innovative design and environmental stewardship. Given that most of these projects are team-based, we foster a culture of collaboration among students, faculty and professionals, which integrates knowledge from fields in architecture, environmental science and engineering. Such an approach significantly amplifies our impact, leading to more resilient and sustainable built environments.

The program is committed to the ongoing learning and adaptation to meet the evolving challenges facing our natural world and communities. Through annual curriculum review with the advisory board and surveys from students and alumni, the program aims to remain at the forefront of sustainable design education.

Assessment:
The curricular and non-curricular elements in which this shared value is covered are indicated more specifically in the PC/SC matrix, included on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development). In the long-range planning, we engage in annual program evaluations to assess our progress and identify areas for improvement by working with the program advisory board, alumni, students, and community partners.

Equity, Diversity, and Inclusion: Architects commit to equity and inclusion in the environments we design, the policies we adopt, the words we speak, the actions we take, and the respectful learning, teaching, and working environments we create. Architects seek fairness, diversity, and social justice in the profession and in society and support a range of pathways for students seeking access to an architecture education.

Program Response:
Equity diversity and inclusion are core values of the institution and our program, and the program takes pride in having one of the most diverse student populations on campus. The program expects all its members, students, faculty, and staff alike, to conduct themselves in a manner that promotes respect, honesty, and integrity. Course feedback and studio critiques are conducted fairly and respectfully in a fashion that provides students with an honest assessment of their work and how they can improve and grow professionally.

It is important to note that the 5-year integrated program is specifically designed to lower the cost of higher education for a 5-year program in architecture that also has a strong engineering foundation. We anticipate that this feature will offer flexibility and diverse employment opportunities to graduates, while appealing to applicants that seek this diversity within their education. The integrated program will be unique in the nation, and we anticipate that this feature will have a positive effect on the diversity within the program and will allow us to attract students from different socio-economic backgrounds. Within the 5-year trajectory, undergraduate WPI students will also benefit from a 20% tuition discount when continuing at the graduate level, further increases affordability.

In the long-range planning, we engage in annual program evaluations to assess our progress and identify areas for improvement by working with the program advisory board, alumni, students, and community partners. The curricular and non-curricular elements in which this shared value is covered are indicated more specifically in the PC/SC matrix, included on page 34. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

Assessment:
The curricular and non-curricular elements in which this shared value is covered are indicated more specifically in the PC/SC matrix, included on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development). In the long-range planning, we engage in annual program evaluations to assess our progress and identify areas for improvement by working with the program advisory board, alumni, students, and community partners.

Knowledge and Innovation: Architects create and disseminate knowledge focused on design and the built environment in response to ever-changing conditions. New knowledge advances architecture as a cultural force, drives innovation, and prompts the continuous improvement of the discipline.

Program Response:
The program believes that innovation and dissemination of technical and non-technical knowledge on design and the built environment are seminal to the solutions we need to address the grand challenges we face in society today. Our approach is forward looking, while at the same time not discarding historical strategies and techniques. As faculty members we actively engage in funded research and scholarship that enhances our understanding of built environments and its impact on the environment, health, and well- being. This includes research on new materials, technologies, and approaches for the making and operation of buildings, and the exploration of new tools for the design and analysis of built environments and their users. All faculty most closely connected to the program pursue funded research and support PhD students, which collectively also leads to research opportunities for our undergraduate students. This spirit of innovation enriches our approach to education, and we encourage students to pursue innovation in their design studio assignments, MQPs, IQPs, GPSs, and thesis work. In addition, students are encouraged to disseminate the created new knowledge through design competition, presentations on campus events and conferences, and publications.
As part of a polytechnic institute, faculty collaborate with colleagues in many engineering sub-disciplines and other disciplines, which further enhances our drive to innovate. The lecture series also offers an important venue to expose students to developments within the field, and to learn how innovation changes the profession.
In alignment with principles of knowledge and innovation, our program is committed to continuous self-improvement through annual curriculum reviews with the program advisory board, alumni, students, and community partners.

Assessment:
The curricular and non-curricular elements in which this shared value is covered are indicated more specifically in the PC/SC matrix, included on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development). In the long-range planning, we engage in annual program evaluations to assess our progress and identify areas for improvement by working with the program advisory board, alumni, students, and community partners.

Leadership, Collaboration, and Community Engagement: Architects practice design as a collaborative, inclusive, creative, and empathetic enterprise with other disciplines, the communities we serve, and the clients for whom we work.

Program Response:
Leadership, Collaboration, and Community Engagement are seminal to our program, the department, and institute. The integrative approach of the program fosters a collaborative environment that embraces the architectural and engineering disciplines simultaneously, which enhances student ability to work with future colleagues more seamlessly in either field. This approach is further extended into the fields of civil engineering as many of our architectural engineering students pursue capstone design work with their civil engineering counterparts, all housed within the same department and building where they take many of their courses together.

The institutional context further enhances collaborative skills when students complete their Interactive Qualifying Project (IQP). The IQP requires students to study the social effects of technology collaboratively with students from other disciplines. This institute-wide degree requirement entails extensive collaboration with students across disciplines including architecture, engineering, humanities, arts, and the social sciences. IQP projects are in collaboration with non-academic partners and are often off-campus, with most students travelling abroad for a full 7-week term.
The program recently also launched "a day in practice" initiative to expose students to different forms of practice. The initiative requires students to spend a full day at a professional firm as part of their studio, with firms including architects, engineers, and contractors. In addition, the program integrates opportunities through internship and co-ops for students to engage in real-world projects that require interdisciplinary collaboration.
Involvement with professional societies also plays a role, with students assuming leadership roles both at the institute and national level in organizations such as the AEI. The program has also pursued creative work with the larger Worcester community, including the city of Worcester and the Worcester school district. Students also have an opportunity to become elected as student representatives for the program and take part in program meetings where they can represent their fellow students.

Assessment:
We actively seek feedback from our advisory board, students, alumni, and community partners to continually refine our approach, ensuring our program stays responsive to the evolving educational needs in leadership, collaboration, and community engagement. The curricular and non-curricular elements in which this shared value is covered are indicated more specifically in the PC/SC matrix, included on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development). In the long-range planning, we engage in annual program evaluations to assess our progress and identify areas for improvement by working with the program advisory board, alumni, students, and community partners.

Lifelong Learning: Architects value educational breadth and depth, including a thorough understanding of the discipline's body of knowledge, histories and theories, and architecture's role in cultural, social, environmental, economic, and built contexts. The practice of architecture demands lifelong learning, which is a shared responsibility between academic and practice settings.

Program Response:
Vitruvius, a Roman Architect and engineer active during the 1st century BC, is known for his multi-volume work titled "De architectura" in which he expressed the idea that all buildings should have strength, utility, and beauty. Many of the historical architects in the western hemisphere have studied his work, and like him often adopted roles which today would be compartmentalized as work done separately by engineers, architects, or artists. Our program

subscribes to the notion of less differentiation, and we encourage students to undertake artistic work that is underpinned by technical understanding and functional analysis. It is the goal of the program to have graduates that aspire to be creative actors that are thoroughly grounded in the history of their disciplines, its current practices, and who are eager to be forward looking forces that can integrate evolving disciplinary knowledge into meaningful work.

The existing undergraduate Architectural Engineering program is a foundational program where students grow to gain an emerging ability to integrate technical knowledge into creative studio projects and other works, including the MQP. It is during the 5th year where we expect to find an increased ability in students to integrate their individual artistic aptitudes with relevant societal and technical demands while getting ready to begin in the profession. The program recognizes that the ability to grow differs from student to student, and the program therefore foremost seeks to instill an aptitude for lifelong learning and curiosity. This journey for excellence and knowledge does not end at the time of graduation, especially in a world where the technological, societal, and environmental landscapes and demands are evolving rapidly.

An appetite for curiosity and learning is intended to permeate throughout the program and curriculum, and this requires continuous effort and vigilance on behalf of the program. Today it manifests itself in many parts, including in studio assignments where students learn how to develop their ability to integrate knowledge and skills. Many studio assignments require precedence studies and readings on a broad range of technical and non-technical topics that are relevant to the design brief. This curricular framework of the 5-year program builds the foundational knowledge and skills needed to start in the profession, but it also achieves a well-rounded background through:

- An integrated architectural and engineering education underpinned by rigorous math, basic, and supplemental science courses,
- A humanities and arts foundation through a combination of depth and breadth requirements,
- An introduction to the social sciences through courses and the IQP,
- Exposure to wider global issues through IQP project work, often abroad,
- Opportunities to complete internships,
- Through guest lecturers that bring time-relevant information to students, with speakers, describing their own creative and professional journeys.

Assessment:
The curricular and non-curricular elements in which this shared value is covered are indicated more specifically in the PC/SC matrix, included on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development). In the long-range planning, we engage in annual program evaluations to assess our progress and identify areas for improvement by working with the program advisory board, alumni, students, and community partners.

NAAB

3—Program and Student Criteria

These criteria seek to evaluate the outcomes of architecture programs and student work within their unique institutional, regional, national, international, and professional contexts, while encouraging innovative approaches to architecture education and professional preparation.

3.1 Program Criteria (PC)

A program must demonstrate how its curriculum, structure, and other experiences address the following criteria.

PC.1 Career Paths—How the program ensures that students understand the paths to becoming licensed as an architect in the United States and the range of available career opportunities that utilize the discipline's skills and knowledge.

Program Response:

Within the interdisciplinary framework of this Master of Architecture program, students are exposed to a wide range of practical aspects of both architectural and engineering disciplines. Our program is tailored to improve students' comprehensive understanding and engagement with the multifaceted nature of professional practice in these fields. This program criteria will be addressed in multiple ways during a student's time in the program:

Engagement with Diverse Professional Practices: Central to our curriculum is a series of guest lectures, drawing from a wide spectrum of professionals in the field, including architects, engineers, contractors, and researchers. These lectures are specifically designed to cover topics pertinent to both engineering and architectural practices, with select lectures having a particular focus on pathways to licensure. Recognizing the value of these interactions, we are considering making attendance a mandatory, non-credit part of our curriculum, ensuring every student benefits from the wealth of knowledge and experience these practitioners bring.

Experiential Learning through the Day-in-Practice Initiative: We piloted a new initiative "Day in Practice" to increase our students' exposure to different forms of professional practice. This program requires students to spend a full day at a professional design or construction firm where they gain exposure to diverse types of professional practice and work experiences. Students were matched with participating firms, about 30 architectural engineering students and 10 firms took part in the 2023 pilot. Host firms were responsible for organizing the day, with activities entailing shadowing tasks related to design, sitting in on meetings, site visits, research, etc. The initiative is currently in its second edition for Spring 2024, with over 45 students participating.

Building Professional Networks: Recognizing the importance of networking in professional development, our department hosts an annual event that allows students to connect with industry practitioners. This event complements the institute's career fair and has been instrumental in opening doors to internship opportunities, facilitating a smoother transition from academic study to professional practice.

Incorporation of Guest Critics: Our program benefits from the involvement of area practitioners who serve as guest critics during studio reviews. This practice not only enriches the critique process but also provides students with invaluable insights from professionals active in the field.

Comprehensive Coursework: The department launched a new introductory "professional practice" undergraduate course for the 23-24 academic year. The program's curriculum includes a required professional practice course (CE 501: Professional Practice) which initially centered on engineering practice but is being expanded to encompass architectural practice

as well. This expansion reflects our commitment to offering a curriculum that is both comprehensive and reflective of the interdisciplinary nature of modern architectural and engineering practices.

The program has appointed a local architect, Peter A. Caruso, to serve as the NCARB Architectural Experience Program (AXP) Architecture Licensing Advisor (ALA) for our students. This contribution entails, for example, giving guest lectures each year to introduce students to NCARB, AXP, the Architectural Registration Exam, and other related topics.

Through these integrations, our M. Arch Program not only emphasizes the importance of theoretical knowledge but also prioritizes practical, real-world experience and professional development, ensuring our students are well-prepared to navigate the path to registration after graduation.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

PC.2 Design—How the program instills in students the role of the design process in shaping the built environment and conveys the methods by which design processes integrate multiple factors, in different settings and scales of development, from buildings to cities.

Program Response:
Our program's design education is grounded in three fundamental principles: 1) expanding the scope of what constitutes design; 2) framing design process as a form of integrative thinking; 3) fostering interdisciplinary work between the fields of engineering and architecture. Our program mainly applies the first principle within our architectural studios, capstone design experience (MQP), Interactive Qualifying Project (IQP), and thesis work. The second principle serves as the basis for both our architectural course and their integration with building structure, climate adaptation, or humanity electives. The third principle is manifested through the concurrent organization of architectural and building technology-oriented courses. This M. Arch program criteria will be addressed in diverse educational components during a student's time in the program:

Progressive Learning through Architectural Studios: In our curriculum, each architectural studio introduces a distinct architectural design challenge, from a simplified to more complex design issues, and from small-scale (studio I and II) to design of larger developments in an urban context (studio III and MQP). Some design studios also include technical design elements that consider building level energy analysis (Studio IV) and enclosure detail development (studio V). The comprehensive capstone design projects (MQP) range in scale and complexity and require integration of architectural design with engineering analysis.

Integrative thinking through Coursework: Our students have the opportunity to select from a range of courses that underscore the significance of integrative thinking in the design process. These courses include ENV 2201: Planning for Sustainable Communities, ENV 2710: Designing for Climate Resilience and Justice and ENV 3100: Adventures in Sustainable Urbanism, among others, provide a comprehensive overview of how sustainable practices and resilience strategies can be integrated into urban planning and design. This selection is further enhanced by courses like CE 3070: Urban and Environmental Planning and BB 290X/HI 331X: Urban Ecology and Environmental Justice, and historical perspectives provided by HI 1311: Introduction to American Urban History, enriching students' understanding of the evolution of urban spaces and their socio-environmental implications.

Project-Based Learning through the Interactive Qualifying Project: The Interactive Qualifying Project (IQP) is a distinctive element of the WPI Plan and WPI's signature project-based curriculum, giving every WPI student the experience of working in interdisciplinary teams to solve a problem or to meet a need that lies at the intersection of science and society. All WPI students complete the IQP in one of the 50 project centers, many of which are abroad (about 90%of students complete their IQP abroad). As a project at the interface of science and society, many projects include design problems that vary in scale and which require collaboration with local municipalities, city planners, communities, architects, and other stakeholders. In addition to project work, travel abroad provides opportunities to students to experience design cultures in different settings.

Great Problems Seminar (GPS): Our innovative approach to education is exemplified by the GPS, a unique offering for first-year students that introduces them to university-level research and project-based learning. The GPS encourages students and faculty to transcend disciplinary boundaries to address global challenges through design. This not-yet-required course exemplifies our dedication to fostering a multidisciplinary mindset among our students from the outset of their architectural education.

Guest Lectures and Study Abroad Opportunities: Our program also features a guest lecture series that brings diverse design professionals to discuss their work, ranging from building construction details to urban-scale master planning projects. This exposure to varied scales of design practice is invaluable for our students. Moreover, we are actively exploring study abroad workshop opportunities, such as the successful pilot workshop on "Responsive Urban Environments" held in collaboration with the Polytechnic of Milan and Drexel University. These international experiences are crucial for students to engage with unique design settings and collaborate on global design problems. These workshops were quite impactful, and we plan to leverage the logistic capabilities of our Global School to embed such opportunities into the curriculum in the future.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

PC.3 Ecological Knowledge and Responsibility—How the program instills in students a holistic understanding of the dynamic between built and natural environments, enabling future architects to mitigate climate change responsibly by leveraging ecological, advanced building performance, adaptation, and resilience principles in their work and advocacy activities.

Program Response:
The program addresses the pressing issue of climate change through architecture and design education is reflected in our comprehensive technical curriculum and diverse educational initiatives, including:

Comprehensive Technical Curriculum Focused on Sustainability: Given the significant impact of energy use on climate change, the program includes a comprehensive technical curriculum that start from fundamental courses in Thermodynamics and Building Physics (AREN 3024), continuous with coursework on building systems including Principles of HVAC Design for Buildings (AREN 3003) and advanced HVAC design (AREN 3006), and finalizes with applied design problems in studio courses focused on building energy modeling (AREN 3020), and building enclosure design (AREN 3022). Students in these courses also learn and practice using various software tools to explore how sustainable design tools can help refine design decisions, including DesignBuilder, Therm, ClimateStudio, Ansys Fluent, Climate Consultant, and others. Students reflect on their role in contributing to the problems or the solutions to the ecological challenges we face in this changing climate.

Diverse Coursework Options: Beyond the technical core, students are also required to select from a range of courses that further explore the intersection of the built environment with sustainability and social justice. These include ENV 2201: Planning for Sustainable Communities, ENV 2710: Designing for Climate Resilience and Justice, ENV 3100: Adventures in Sustainable Urbanism, CE 3070: Urban and Environmental Planning, HI 1311: Introduction to American Urban History, HI 2310: Topics in Urban History, BB 290X/HI 331X: Urban Ecology and Environmental Justice. Coursework on climate change adaptation include IGS 501: Theorizing Place, Community, and Global Environmental Change, IGS 505: Qualitative Methods for Community-Engaged Research, IGS 510: Human Dimensions of Global Environmental Change, IGS 545: Climate Change: Vulnerability and Mitigation, and IGS 590: Capstone Seminar: Comparative Climate Action. A new course, "Community and Environmental Analysis" (CE 550), is currently being developed to deepen students' understanding of community-focused environmental analysis.

Graduate Design Thesis with a Focus on Climate Adaptation: The graduate design thesis involves creating and advancing a comprehensive architectural project that exhibits adequate scope and intricacy. Thesis design topics are developed in close collaboration with a thesis committee, which is composed of a primary thesis advisor and an advisor in a focus area. A formal thesis rational and plan is developed during the thesis research seminar. The Master design thesis is furthermore underpinned by elective courses that are thematically aligned with a focus area, allowing students to broaden their skills and develop a meaningful grasp of a thematic area of interest. To ensure this depth, students complete at least three courses of thematically related work. Different focus areas are possible and currently include a focus on (1) structures, and (2) climate adaptation. While we expect all students to develop a comprehensive understanding of the link between built and natural environments, students can also opt to dedicate their thesis work more specifically on the topic of climate adaptation.

Engagement with Global and Community Climate Adaptation: The guest lecture series and the involvement with the Community Climate Adaptation program at the Global School underscore this program's engagement with global climate challenges. These initiatives provide students with critical insights into the environmental impacts of buildings, climate change adaptation strategies, and the broader implications of architectural design on global environmental change. In addition, the Interactive Qualifying Project (IQP) is an essential element of the WPI's project-based curriculum, giving every WPI student the experience of working in interdisciplinary teams to solve a problem or need that lies at the intersection of science and society. Given the acute nature of climate related insecurities, many IQPs consequently focus on environmental issues such as climate change, water scarcity, and energy security. These studies require a comprehensive investigation of the link between the natural and socio-techno-economic systems.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

PC.4 History and Theory—How the program ensures that students understand the histories and theories of architecture and urbanism, framed by diverse social, cultural, economic, and political forces, nationally and globally.

Program Response:
The integration of architectural history and theory constitutes a pivotal component of the curriculum. Specifically, our curriculum, spanning architectural studios to diverse courses, incorporates elements of history and theory. Each of our architectural studios, along with various other courses, incorporates elements of history and theory to a certain degree.

Architectural studios discuss concepts and historical precedents within architectural history and theory. Meanwhile, studio instructors often integrate specific readings and discussions related to these topics, which are relevant to the studio projects. The program also offers a diverse array of courses from which students may choose including:

AR 2114: Modern Architecture in the American Era, 1750-2001 and Beyond (3 units) This course studies, in a non-technical way, Americas buildings and places, in the context of world architecture in modern times. The history of American architecture was shaped by the forces that shaped America, from its political emergence in the eighteenth century to the post-9/11 era. These forces include dreams of social and spiritual perfection; a tight and conflicted relation with nature; and the rise and spread of industrial capitalism. The same forces created the Modern Movement in architecture. How are modernism and American architecture interrelated? Illustrated lectures, films, and tours of Worcester architecture explore the question, while training students in the methods of architectural history and criticism.

AR 2115: Topics in Architecture Since 1960 (3 units) This course offers a detailed overview of the history of architecture between the consolidation of modern architecture in standard architectural practice and the present period of pluralism. Topics covered will include: modernism and its critique in the developing world; Louis I. Kahns and Robert Venturis critiques of modernist architecture culture; the High-Tech movement; utopian alternatives to the modernist city; the return of pre-modern urbanism; Critical Regionalism; the rise of Postmodernism 1970-80; the developer-led architectural boom of the 1980s; Deconstructivism and critical dissolution of rationalist form; the introduction of CAD in architectural design and its impact on the blob architecture of Frank Gehry and others; the development of global models of architectural practice; sustainable architecture and urbanism; global developments in other, related design fields and their consumer culture.

AR 3112: Modernism, Mass Culture, and the Avant-Garde (3 units) This course explores the role of art in the modern world: Can art serve as a vehicle for social change, or should it be a self-critical discipline that primarily pursues aesthetic ends? What is the relationship between art and mass culture? Utilizing primary sources, the course focuses on various theorists and artistic trends since the mid-nineteenth century that have attempted to resolve this dilemma.

HI 1311: Introduction to American Urban History (3 units) An introduction to the history of the American city as an important phenomenon in itself and as a reflection of national history. The course will take an interdisciplinary approach to study the political, economic, social, and technological patterns that have shaped the growth of urbanization. In addition to reading historical approaches to the study of American urban history, students may also examine appropriate works by sociologists, economists, political scientists and city planners who provide historical perspective.

HI 2310: Topics in Urban History (3 units) This course surveys the interplay of social, economic, demographic, political and cultural forces in shaping the growth, decline and occasional rebirth of urban spaces. Emphasis is placed upon building chronological narratives while attending to the themes, approaches, and sources historians use to reconstruct the tangled infrastructures, stratified economies, segregated spaces and political/ administrative structures of cities. Geographies will vary across sections and topics may include Industrializing Cities, Race and Urban Space, Post-Industrial Cities, Urban Technological Infrastructures, or Social Justice in the City.

In addition to diverse courses, this program curates a series of guest lectures featuring distinguished speakers and history and theory topics are presented regularly by guest lecturers. We plan on collaborating more closely with Professors Samson and Cullon in the Humanities and arts department, both of whom deliver a significant portion of our program's

history and theory curriculum. In addition, guest lecturers can also be coordinated with our Social Science program and faculty within the Global School.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

PC.5 Research and Innovation—How the program prepares students to engage and participate in architectural research to test and evaluate innovations in the field.

Program Response:
While more latent forms of research are integrated into all of the studios, a more active and conscious approach to using research as a basis for learning and design occurs in our required Interactive Qualifying Project (IQP), Major Qualifying Project (MQP), and design thesis. Our program features two fundamental kinds of research, which are particularly apparent in history/theory courses and the technology/engineering sequence. It is in these two areas that traditional publishable contributions are made.

History/Theory Scholarship and Discourse: Beginning with HI 1311: Introduction to American Urban History, and followed by AR 2114: Modern Architecture in the American Era, 1750-2001 and Beyond, or AR 2115: Topics in Architecture Since 1960, or HI 2310: Topics in Urban History and AR 3112: Modernism, Mass Culture, and the Avant-Garde, students are required to attend lectures, complete readings and conduct research for their final project. They compile their research outcomes into papers, using this written work as a method to assemble their thoughts and communicate them coherently.

Understanding of the theoretical and applied research methodologies and practices used during the design process.

Technology/Engineering Research and Innovation: In our tech/engineering courses such as AREN 3024: Thermodynamics and Building Physics, AREN 3003: Principles of HVAC Design for Buildings, and AREN 3006: Advanced HVAC Design, students are required to draw on existing research and scientific studies, specifically those found in published, peer-reviewed articles, to acquire understanding and inspiration for effectively integrating this knowledge into their class projects. In AREN 3020: Architectural Design IV - Building Energy Simulation Studio, the course offers students the opportunity to develop an understanding of the link between energy and sustainability in architecture and introduces the fundamentals and applications of energy simulation tools. AREN 3022: Architectural Design V - Building Envelope Design deepens students understanding of the architectural design development process with special focus on the design and detailing of building envelopes. Students are expected to expand their knowledge of detailing by continually researching and evaluating both historical and technical developments.

Design Research: A combination of these two types of research is integrated into the Interactive Qualifying Project (IQP) and Major Qualifying Project (MQP), which are considered the capstone degree projects and are comparable to thesis projects in other architecture programs. Students involved in this yearlong MQP write a critically informed research report on a topic of their choice or in mutual agreement with their faculty advisor. They adhere to all national standards in their report, including an abstract, annotated outlines, and a fully footnoted text and bibliography in either Chicago or Harvard style. Faculty assist the students throughout the process with tools to organize references. Students are expected to generate innovative ideas from research-based practices and produce original thinking/design related to their findings.

Graduate Thesis: The graduate design thesis involves creating and advancing a comprehensive architectural project that exhibits adequate scope and intricacy. Thesis design topics are developed in close collaboration with a thesis committee, which is composed of a primary thesis advisor and an advisor in a focus area. A formal thesis rational and plan is developed during the thesis research seminar. The Master design thesis is underpinned by elective courses that are thematically aligned with a focus area, allowing students to broaden their skills and develop a meaningful grasp of a thematic area of interest. To ensure this depth, students complete at least three courses of thematically related work. Different focus areas are possible and currently include a focus on (1) structures, and (2) climate adaptation.

Beyond the classroom, an array of additional experiences exists to augment and deepen the research and innovation environment of the M. Arch program. All tenured and tenure-track faculty members maintain active research agendas, and a significant portion of our full-time and part-time faculty engage in research activities as well. Events like the Graduate Research Innovation Exchange (GRIE) and the annual Three Minute Thesis (3MT) competition, along with the Undergraduate Research Projects Showcase day, provide opportunities for students and faculty to present their research projects to the school and institute, fostering a culture of research and scholarship externally to regular classroom activities.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

PC.6 Leadership and Collaboration—How the program ensures that students understand approaches to leadership in multidisciplinary teams, diverse stakeholder constituents, and dynamic physical and social contexts, and learn how to apply effective collaboration skills to solve complex problems.

Program Response:
Leadership and collaboration are essential elements of the Program's educational approach, deeply embedded within our curriculum. This integration occurs both explicitly, with direct instruction focusing on these areas as essential aspects of professional practice, and implicitly, through various curricular and extracurricular activities that involve students in both solo and collaborative projects. For example, project-based teamwork is one of the characteristics of a WPI education and is most prominently present in the IQP and MQP requirements. For the IQP, students collaborate with students from different majors to work on problems that require input from different disciplines. Most (>90%) of the IQPs are set in an off-campus project center, most of which are abroad, and require students to collaborate with external stakeholders such as government agencies, NGOs, local communities, or private companies. Students investigate problems that are new to them while being submerged into a new setting, this requires close collaboration among peers as they each bring different skills to the table. Similarly, most MQPs are completed in a team format where members work together in a collaborative fashion to set goals, plan tasks, and meet project objectives. In addition, the architectural design studio also entails a range of individual and teamwork design assignments.

Indirect instruction of leadership and collaboration takes place through active participation in the WPI chapter of the Architectural Engineering Institute (AEI) is an active student organization focused on benefiting students in their academic and professional development. The student led chapter elects students for various positions each year and has an active mentee program whereby senior students provide guidance to younger incoming students. The group accompanies faculty members to the annual AEI conference, where students take part in leadership programs and have an opportunity to run for national office in the student organization. We plan on establishing a similar student chapter of the American Institute of

Architectural Students (AIAS). Each year, students elect representatives to take part in program planning meetings. The role requires students to engage in collaborative discussions with their peers, and to assume a leadership role among their peers, advocate for improvements, and vocalize student concerns. The "day in practice" program furthermore provides opportunities for students to observe how leadership works in a professional setting, especially as students attend meetings and see how the industry operates in the work environment. The program elects peer learning assistance positions, typically from the more senior classes, to assist in coordinating these program events and initiatives.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

PC.7 Learning and Teaching Culture—How the program fosters and ensures a positive and respectful environment that encourages optimism, respect, sharing, engagement, and innovation among its faculty, students, administration, and staff.

Program Response:
The faculty members in the program adhere to an open-door policy, fostering an environment where the lines between students, faculty, and staff are notably blurred. The program's classes are structured to be small enough to ensure a strong sense of community among students, as well as close interactions with faculty, administration, and staff. This manageable size cultivates a warm camaraderie throughout the academic environment, enhancing the educational experience.

Central to the program are two primary studio spaces, which are utilized by students across different classes. This arrangement, known as the vertical studio format, is instrumental in promoting peer-to-peer learning and is pivotal in creating a positive, collaborative atmosphere. Such an environment is conducive to mutual growth and learning, reinforcing the program's community-centric ethos.

Beyond these studio spaces, the department offers additional amenities like a student lounge, conveniently located next to the teaching assistant office/lounge and the administration offices. Regularly organized bi-weekly events, including a "tea and cookies" day and a "bread" day, are highlights that encourage social interaction and build a vibrant community within the student lounge area. Several social events are organized throughout the year, such as guest lectures, barbeques, pop-corn Wednesday, project presentation day, and a senior banquet. Such gatherings not only enrich the students' academic life but also strengthen their social connections, contributing to a well-rounded educational experience.

Student representation is another key feature of the program, with students electing representatives annually to participate in select program meetings. This inclusion ensures that student voices are heard and considered in the program's ongoing development and decision-making processes.

Additionally, the program boasts an active industry advisory board, which maintains regular interaction with the students, providing invaluable insights, internship opportunities, and employment prospects. They also encourage their organization's alumni to engage in mentoring roles, especially for pivotal projects like the capstone design, thereby bridging the gap between academic learning and professional practice. This symbiotic relationship not only enhances the students' educational journey but also prepares them for their future careers, embedding practical industry experience into the fabric of their academic curriculum.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

PC.8 Social Equity and Inclusion—How the program furthers and deepens students' understanding of diverse cultural and social contexts and helps them translate that understanding into built environments that equitably support and include people of different backgrounds, resources, and abilities.

Program Response:
The program offers a diverse range of courses that focus on social equity and inclusion, allowing students to tailor their learning to encompass critical societal issues. These offerings include HI 1311: Introduction to American Urban History, HI 2310: Topics in Urban History, BB 290X/HI 331X: Urban Ecology and Environmental Justice, ENV 2201: Planning for Sustainable Communities, ENV 2710: Designing for Climate Resilience and Justice, ENV 3100: Adventures in Sustainable Urbanism, CE 3070: Urban and Environmental Planning. These courses delve into specialized topics that merge environmental concerns with societal needs, emphasizing the importance of sustainable and equitable urban development.

The Office of Diversity, Inclusion, and Multicultural Education (ODIME) promotes and oversees all student-facing diversity, equity, inclusion, and belonging (DEIB) initiatives. The Office has several dedicated staff members available to support or assist undergraduate and graduate students with their social, personal, cultural, spiritual, and professional development, ensuring a comprehensive approach to fostering an inclusive educational environment.

The Day-in-Practice Initiative represents a forward-thinking approach to education, introduced to broaden students' practical understanding of their field. This initiative requires students to spend an entire day at a professional design or construction firm, offering them firsthand experience with different professional practices and work environments. Recognizing the gender dynamics of the student body, the initiative places a special emphasis on including female mentors at participating firms and prioritizes collaboration with firms predominantly staffed by women. This thoughtful inclusion aims to provide all students, particularly females, with relatable role models and diversified professional insights, enriching their educational journey and preparing them for future career challenges.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

3.2 Student Criteria (SC): Student Learning Objectives and Outcomes

A program must demonstrate how it addresses the following criteria through program curricula and other experiences, with an emphasis on the articulation of learning objectives and assessment.

SC.1 Health, Safety and Welfare in the Built Environment—How the program ensures that students understand the impact of the built environment on human health, safety, and welfare at multiple scales, from buildings to cities.

Program Response:

The curriculum requires students to have knowledge of codes and regulations related to the health, safety, and welfare within the built environment. An introduction to codes is provided in AREN 2023 - Introduction to Architectural Engineering, where students first become familiar with the IBC and IECC through a series of assignments. The sequence continues with technical courses, on topics such as Building Physics and HVAC Design, where students learn about the impacts of design on indoor environmental health and thermal comfort. Students also develop a deeper understanding in our topical studios. For instance, in Architectural Design II - Light and Lighting Systems, students learn about standards for visual comfort and utilize modeling tools to test and adapt their design to comply with these standards. In Architectural Design III, students design a multistory building for which they investigate code requirements, including emergency egress and accessibility, and do a site analysis and a review of zoning requirements. In Architectural design IV – Building Energy Simulation, students learn about the impact of building energy usage, are introduced to energy standards and best practices, and utilize energy modeling tools to demonstrate compliance with these standards for their design project. In Architectural Design V – Building Enclosure Design, students develop details for their projects that are compliant with interrelated performance requirements – thus developing emerging skills to integrate such requirements into technical solutions.

Our topical studio also requires students to develop a project within the constraints of the applicable zoning regulations in various contexts. Thematic courses, such as "Designing for Climate Resilience and Justice", and "Urban Ecology and Environmental Justice", emphasize the interconnectedness between architectural design, environmental sustainability, and societal welfare. By examining real-world developmental challenges and ethical considerations, students develop a holistic understanding of their role as architects in promoting human and environmental well-being through their design decisions. The Interactive Qualifying Project (IQP) also contributes significantly to this understanding by requiring students to develop meaningful societal actions working with students from other disciplines.

In the 4th year Major Qualifying Project (MQP), students are then required to demonstrate their holistic understanding of these concepts within a comprehensive capstone project – which also requires a review of applicable codes and standards. Finally, thesis work is expected to demonstrate understanding and attainment of this criterion.

The courses that address various aspects of this criterion include:

AREN 2023 Introduction to Architectural Engineering
AREN 2004: Architectural Design II - Light and Lighting Systems
AREN 3002: Architectural Design III
AREN 3003: Principles of HVAC Design for Buildings
AREN 3006: Advanced HVAC System Design
AREN 3020: Architectural Design IV - Building Energy Simulation
AREN 3022: Architectural Design V - Building Envelope Design
AREN 3024: Building Physics
Major Qualifying Project
Interactive Qualifying Project

ENV 2201: Planning for Sustainable Communities
ENV 2710: Designing for Climate Resilience and Justice
HI 1311: Introduction to American Urban History
HI 2310: Topics in Urban History
BB 290X/HI 331X: Urban Ecology and Environmental Justice

Assessment:
The criterion can be met through mandatory coursework and projects, since the outcomes of these activities require students to have knowledge of the various aspects of HSW at different scales. The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

We plan on collecting primary evidence for attainment of this criterion from (i) AREN 3003: Principles of HVAC Design for Buildings, (ii) the Major Qualifying Project, (ii) the Master Design Thesis. As the program develops and when results of assessment should show weakness in meeting this criterion, the program can then either revise course and project requirements, or create and/or additional curricular elements.

SC.2 Professional Practice—How the program ensures that students understand professional ethics, the regulatory requirements, the fundamental business processes relevant to architecture practice in the United States, and the forces influencing change in these subjects.

Our program is designed to provide students with a comprehensive understanding of the professional ethics, regulatory requirements, and fundamental business processes that are relevant to architectural practice in the United States. We aim to equip our students with the skills and knowledge necessary to influence change in these subjects. To achieve these goals, we have developed a curriculum that includes several key courses focused on professional practice. This sequence consists of two mandatory courses required for all students, and a requirement to complete two additional elective courses in topical subareas relevant for this criterion. The two mandatory courses are:

CE 501 Professional Practice.
This course examines various aspects of professional practice, including legal issues of business organizations, contracts and liability; business practice of staffing, fee structures, accounts receivable, negotiation and dispute resolution, loss prevention; marketing and proposal development; project management involving organizing and staffing, budgeting, scheduling, performance and monitoring, and presentation of deliverables; professionalism, ethics and responsibilities.

CE 3022, Legal aspects of Professional practice This course focuses on the legal underpinnings that regulate the design and execution of construction projects and the relations between their participants. The subject is presented according to the various phases of a construction project, from inception to handover. The overall objective is to develop an awareness of the legal aspects that regulate the exercise of the architectural and civil engineering profession and of the environmental constraints of construction. Topics such as permitting process, design/engineering services and ethical issues are included

Note that an alternative undergraduate professional practice course was developed and offered in the 2023-2024 academic year: CE 302X Design Professions and Practice: The outcomes of this course also cover a wide range of practical aspects pertinent to the design professions. Topics include career opportunities; ethics; professional responsibilities; legal and regulatory issues; management principles; equity issues; and professional licensure. The role of design

professions in addressing contemporary local and global issues, such as climate change and energy production, is also explored.

In addition to these 2 required mandatory courses, students are also required to broaden their understanding by completing two additional professional practice electives, which are selected from the following offerings:

Student are required to complete 2 additional courses from the following offerings:
CE 3020: Project Management
CE 3025: Project Evaluation
CE 3070: Urban and Environmental Planning
CE 580: Advanced Project Management
CE 584: Advanced Cost Estimating Procedures
CE 535: Integration of Design and Construction
CE 536: Construction Failures: Analysis and Lessons

Our program also offers experiential learning opportunities through guest lectures, panel discussions, and industry partnerships. These provide additional valuable insights into current practices and emerging trends, ensuring that our students are well-prepared to navigate the complexities of professional practice.

We also organize Day-in-Practice events to further enrich our students' understanding of this criterion. Practice Day provides an immersive experience where students interact directly with practicing architects and professionals from various sectors of the industry - for a full day. Through workshops, networking sessions, site-visits, shadowing, sitting in on meetings, and hands-on activities, our students gain valuable insights into the day-to-day realities of architectural practice and forge connections that can lead to internships and employment opportunities. This program has been offered in the 2022-2023 and 2023-2024 academic years involving mostly first- and second-year students, allowing them to gain insights early in their academic program. The activity is structured as a mandatory part of AREN 3002 and AREN 2023. Starting with academic year 2024-2025 – the program will run the event twice each academic year (Fal &,Spring) so that students have at least 4 opportunities to experience different forms of practice while in the program. This experience is in addition to potential internships and co-ops - which typically occur after a student's second year. A survey is administered among students and participating firms to collect feedback on the experience – which will/can be used for assessment and self-improvement purposes.

Our lecture series also features voices from the architectural community who share their expertise and perspectives on contemporary issues shaping the profession. Topics range from sustainable design and emerging technologies to the business aspects of architecture and navigating regulatory frameworks. By exposing our students to diverse viewpoints and cutting-edge developments, the lecture series broadens their understanding of the multifaceted nature of professional practice and inspires them to think critically and innovatively.

Assessment:
The courses and non-curricular activities in which attainment of this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

We plan on collecting primary evidence for this criterion from the CE501 Professional Practice, and CE 3022, Legal aspects of Professional practice courses. Additional evidence will be collected by surveying participants of our day-in-practice events (both students and participating firms).

As the program matures, we will also conduct surveys of our alumni to evaluate various indicators of their professional success and engagement. These surveys will enable us to

monitor essential metrics such as the percentage of graduates who attain architectural registration within five years of graduation, the proportion of students who become members of AIA upon graduation and in subsequent years, as well as those who actively participate in the Architectural Experience Program (AXP) and Architect Registration Examination (ARE) while enrolled in the program. By collecting and analyzing this data over time, we can further identify our program's strengths and opportunities for improvement, ensuring that our curriculum remains relevant and responsive to the evolving needs of the profession.

SC.3 Regulatory Context—How the program ensures that students understand the fundamental principles of life safety, land use, and current laws and regulations that apply to buildings and sites in the United States, and the evaluative process architects use to comply with those laws and regulations as part of a project.

Program Response:
Ensuring that students comprehend the regulatory framework governing architectural practice is a fundamental tenet of our program's mission. Our curriculum is designed to teach students the multifaceted aspects of building code, land use regulations, and relevant laws applicable to buildings and sites in the United States. This criterion is met in the mandatory coursework, including CE 4071: Land Use Development and Controls, CE 3022, Legal aspects of Professional practice, and CE 501: Professional Practice. These courses require students to develop an understanding of regulatory requirements within the context of architectural practice. By analyzing case studies and real-world scenarios, students gain practical insights into how architects navigate regulatory challenges throughout the project. This course not only imparts theoretical knowledge but also encourages critical thinking and problem-solving skills essential for regulatory compliance.

Our program also integrates regulatory learning into architectural studio projects, in addition to traditional coursework. Through hands-on exercises, for example in Architectural Design Studio III (AREN 3002), students engage with building codes, zoning ordinances, and accessibility standards. This ensures that regulatory considerations are embedded within the design process from the first stage of the design. Our program also fosters interdisciplinary collaboration to broaden students' perspectives on regulatory issues. By partnering with experts in related fields such as environmental science and urban planning, students gain insights into the interconnected nature of regulatory frameworks and their impact on architectural design decisions. This holistic approach enables students to develop comprehensive solutions that address not only regulatory compliance but also broader societal and environmental concerns.

This student criteria will be primarily covered in the following courses:
CE 3022: Legal Aspects of Professional Practice
CE 4071: Land Use Development and Controls
CE 501: Professional Practice
AREN 3002 Architectural Design III
MQP

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

We plan on collecting primary evidence for attainment of this criterion from the CE 4071: Land Use Development and Controls, CE 3022, Legal aspects of Professional practice, and CE 501: Professional Practice, and AREN 3002 Architectural design III. Additional evidence may also be collected from the MQP reports.

NAAB

Program Response:

Our program emphasizes foundational principles that allow students to critically navigate a changing technological landscape. The approach is aimed at ensuring that our graduates can explore, evaluate, and incorporate new building products and technologies in their design and have ability to effectively communicate with various technical experts. In addition to foundational principles, the sequence also covers practical aspects of building construction, and we strongly encourage students to explore emerging technologies and innovative construction methods within their studio, capstone, and master thesis work.

All our technical courses are underpinned by required mathematics and basic science courses. The curriculum starts with an introductory course that covers materials and methods of construction, structural design, and energy usage. The "structural" design curriculum starts with foundational courses in analytical mechanics, strength of materials, and structural analysis. These foundational courses are followed by system-specific structural design courses, including courses on reinforced concrete, steel, and/or wood. Our students take these courses alongside their peers in the civil engineering major – and our graduate are on an equal footing regarding their capacity to design and analyze structural solutions. The "mechanical" design curriculum starts with foundational courses in thermodynamics and fluid mechanics. The sequence continues with a building physics course that covers foundational principles of heat, air, and moisture transfer in buildings, and introduces principles of thermal comfort and energy efficient design. These foundational courses are followed by two courses on the design of HVAC systems and passive alternatives.

Students also apply their emerging foundational technical understanding within our integrated studio model. The undergraduate studio curriculum is structured around topical technical areas that allow students to apply their theoretical understanding of technical topics into projects. All our studios include technical lectures in addition to the desk review session. All studio's meet 12 hours each week (3 afternoons), and about 1/3 of this time is utilized to teach technical subject matter and modeling tools. Studios are centered around structures, light and lighting systems, energy use, and design development of high-performance building enclosures.

The undergraduate sequence is capped by the MQP, which requires students to integrate structural and energy principles into an architectural project, and to provide evidence for their performance through engineering analysis. In addition to required courses, the program also offers optional courses and activities that further our students' technical knowledge. For example, a new experimental course on the topic of artificial intelligence in parametric design and fabrication will be piloted in the Fall '24 semester. We also plan intensive design workshops, some of which have technical elements. For example, a workshop with the University of Panama to explore architectural design at the intersection of urban planning and energy efficiency, is planned for Spring '25.

The master thesis also offers an opportunity for students to further explore technical topics through advanced research and design. As part of their thesis, students are required to complete graduate courses that underpin the thesis work. For example, if a student wishes to deepen their technical understanding in structural engineering, they will complete graduate courses in areas such as finite element analysis and are expected to use the tools and techniques in a creative fashion to develop an architectural project of their choosing.

By offering a diverse range of courses, starting with foundational mathematics, physics, and engineering courses, we ensure that students gain expertise in various technical aspects

relevant to architectural practice, empowering them to address the multifaceted challenges of contemporary building construction and systems engineering and design.

This student criteria will primarily be addressed in the following courses:

PH 2101: Thermodynamics
ES 3004: Fluid Mechanics
AREN 2023: Introduction to Architectural Engineering Systems
AREN 3024: Building Physics
AREN 3003: Principles of HVAC Design for Buildings
AREN 3006: Advanced HVAC System Design
AREN 2004: Architectural Design II - Light and Lighting Systems
AREN 3002: Architectural Design III - Structures
AREN 3020: Architectural Design IV - Building Energy Simulation
AREN 3022: Architectural Design V - Building Envelope Design

CE 2000: Analytical Mechanics I
CE 2001: Analytical Analysis II
CE 2002: Introduction to Analysis and Design
CE 3006: Design of Steel Structures.
CE 3008: Design of Reinforced Concrete Structures.
CE 3010: Structural Engineering
CE 3044: Foundation Engineering
CE 4007: Matrix Analysis of Structures
CE 4017: Prestressed Concrete Design

Major Qualifying Project
Master Design Thesis

Graduate courses for thesis projects focusing on structures:
CE/ME 5303: Applied Finite Element Methods in Engineering
CE 510: Structural Mechanics
CE 511: Structural Dynamics
CE 514/ME 5383: Continuum Mechanics
CE 519: Advanced Structural Analysis
CE 524: Finite Element Method and Applications
CE 531: Advanced Design of Steel Structures
CE 532: Advanced Design of Reinforced Concrete Structures
CE 534: Structural Design for Fire Conditions

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

We plan on collecting evidence for attainment of this criterion from all the required technical course offerings, while collecting primary evidence from studios, the MQP, and thesis work.

SC.5 Design Synthesis—How the program ensures that students develop the ability to make design decisions within architectural projects while demonstrating synthesis of user requirements, regulatory requirements, site conditions, and accessible design, and consideration of the measurable environmental impacts of their design decisions.

Program Response:
Our architectural program is designed to equip students with the skills and knowledge necessary for success in the field of architecture. One of the major focuses of our program is

the development of design synthesis skills, which is emphasized throughout the curriculum. Design synthesis is a practical tool that is taught comprehensively throughout the five architectural studio courses. To ensure that our students are equipped with the skills they need to succeed in practice, we pay specific attention to integrating user requirements, regulatory standards, site conditions, accessible design, and environmental impacts into all architectural projects.

This student criteria will be primarily addressed in the following courses:

AREN 2002: Architectural Design I - Design Foundation
AREN 2004: Architectural Design II - Light and Lighting Systems
AREN 3002: Architectural Design III - Structural design integration
AREN 3020: Architectural Design IV - Building Energy Simulation
AREN 3022: Architectural Design V - Building Envelope Design
Major Qualifying Project
Master Design Thesis

Our studio courses are designed to scaffold students' understanding of design synthesis principles, starting from the foundational studios and culminating in their major qualifying project and design thesis. In the introductory studio and design foundation, students explore site conditions and basic user requirements, gradually advancing to more complex considerations such as structural design integration and building envelope design in later studios. For example, in Architectural Design IV, students may be tasked with designing a net-zero library, integrating user needs with passive and active energy design strategies, and environmental impacts into their designs.

Throughout the studio projects, students are required to synthesize design elements with building code requirements and construction design standards. They continuously engage in the iterative process of design synthesis and receive regular feedback through desk reviews and assignments. This hands-on approach ensures that students are equipped with the necessary skills and confidence to succeed in architectural practice.

Our program places a strong emphasis on the collaborative nature of architectural practice, fostering a sense of community and teamwork among our students, and many of our projects entail teamwork. We encourage students to engage in integrated project teams and sustainable design charrettes, as we believe that the best architectural solutions are born out of collaboration. These opportunities provide a platform for learning and foster a sense of belonging and camaraderie among our students.

In addition to addressing environmental considerations, our program also emphasizes integrating structural design principles within architectural studio projects. Through dedicated courses and studio projects, students learn to collaborate with structural engineering faculty and incorporate structural systems into their designs. Studio projects often include opportunities for interdisciplinary collaboration, which allows students to work closely with civil engineering faculty and gain insights and perspectives from different disciplines.

Our program is designed to prepare students for the challenges they will face in their future careers. By engaging in joint critiques, design reviews, case studies of certified high-performance buildings, and reflecting on global models of sustainability, students gain a holistic understanding of their role as architects in addressing contemporary challenges. Our curriculum also includes concurrent courses in energy and environmental systems that are integrated with studio projects, providing students with essential knowledge and tools to assess the environmental impacts or structural analysis of their design decisions.

Ultimately, our architectural program is not just about theory, but practical application. We believe that hands-on experience in real-world scenarios is invaluable in preparing students for their future careers. Our program is designed to equip students with the skills, knowledge, and mindset necessary to navigate the complex intersection of user needs, regulatory requirements, site constraints, and environmental and social considerations in architectural design synthesis.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

We plan on collecting primary evidence for attainment of this criterion from studios, MQPs, and the graduate thesis. A student's design portfolio may also be used as supporting evidence.

SC.6 Building Integration—How the program ensures that students develop the ability to make design decisions within architectural projects while demonstrating integration of building envelope systems and assemblies, structural systems, environmental control systems, life safety systems, and the measurable outcomes of building performance.

Program Response:
Building Integration is a core component of our curriculum, which spans several courses such as architectural design studios, engineering systems courses, and building physics. Students gain theoretical knowledge and practical experience to make informed design decisions while integrating diverse building components and systems. This student criteria will be primarily addressed in the following courses:

AREN 2004: Architectural Design II - Light and Lighting Systems
AREN 2023: Introduction to Architectural Engineering Systems A
REN 3002: Architectural Design III - Structures
AREN 3003: Principles of HVAC Design for Buildings
AREN 3006: Advanced HVAC System Design
AREN 3020: Architectural Design IV - Building Energy Simulation
AREN 3022: Architectural Design V - Building Envelope Design
AREN 3024: Building Physics
Major Qualifying Project
Master Design Thesis

Introduction to Architectural Engineering Systems (AREN 2023) is a foundational course where students learn about the intricate interplay between various building systems. Covering topics such as structural design, energy foundation, and building envelopes, this course provides students with a comprehensive overview of the essential components that make up a building. Through case studies, students begin to learn how to integrate systems effectively to support architectural objectives while ensuring optimal performance and sustainability.

Architectural Design II - Light and Lighting Systems (AREN 2004) is a course that focuses on the relationship between architectural spaces and light, including lighting systems. Students explore the principles of lighting design, considering factors such as intensity, color, and distribution to create visually appealing and functionally efficient environments. Through hands-on projects and simulations, they gain practical experience in designing lighting schemes that enhance visual wellbeing and architectural intent, while meeting user needs and regulatory requirements.

Architectural Design III - Structures (AREN 3002) focuses specifically on integrating structural systems into architectural projects. Students learn to conceptualize and design structural elements that provide support and stability while enhancing the overall intent of the building. Through a series of design exercises, model making practices, and case studies, students start

to develop the skills to integrate structural components into their architectural designs, while considering factors such as material properties, load-bearing capacities, and construction methods.

Principles of HVAC Design for Buildings (AREN 3003) and Advanced HVAC System Design (AREN 3006) offer students an opportunity to learn about HVAC systems and their integration within architectural designs. From understanding basic principles to exploring advanced concepts such as energy modeling and optimization techniques, students gain valuable insights into designing HVAC systems that prioritize energy efficiency, occupant comfort, and indoor air quality. Through hands-on projects and simulations, students apply their knowledge, optimizing HVAC designs for various building types and occupancy requirements.

Architectural Design IV - Building Energy Simulation (AREN 3020) equips students with the tools and techniques needed to evaluate building energy performance. Through computer simulations and performance analysis, students learn to assess the energy efficiency of architectural designs and identify opportunities for improvement. By integrating energy-efficient strategies and sustainable design principles, students develop solutions that minimize environmental impact while maximizing occupant comfort and well-being.

Building Envelope Design (AREN 3022) focuses on integrating building envelope systems to optimize thermal performance and sustainability. Students explore a range of materials and construction techniques, considering factors such as insulation, air sealing, and moisture management. Through design exercises and material explorations, students learn to develop details for building envelopes that enhance energy efficiency while also contributing to the overall architectural intent.

In Building Physics (AREN 3024), students gain a deeper understanding of the fundamental principles governing building behavior. Topics such as heat transfer, moisture control, and indoor air quality are explored in detail, providing students with insights into how these factors influence building performance and design decisions. Through simulations and experiments, students analyze the dynamic interactions between building systems and environmental conditions, allowing them to make informed design choices that optimize building performance and occupant well-being.

Students demonstrate their understanding of building integration principles through the Major Qualifying Projects and the master Design Theses. They tackle real-world design challenges under the guidance of faculty mentors, integrating user needs, regulatory requirements, and environmental considerations to deliver innovative and sustainable architectural solutions. These capstone experiences allow students to apply their knowledge and skills to address complex architectural problems.

Assessment:
The courses and non-curricular activities in which this criterion is assessed are indicated in the PC/SC matrix, include on page 35. The assessment occurs on alternating cycles of reviews (see section 5.3 Curricular Development)

We plan on collecting primary evidence for attainment of this criterion from studios, MQPs, and the graduate thesis. A student's design portfolio may also be used as supporting evidence.

PC/SC Matrix

A course/criteria matrix ("PC/SC Matrix") with courses listed by semester (rows) mapped against Shared Values, Program Criteria, and Student Criteria (columns). Filled cells indicate coverage; solid black squares in the legend indicate "Assessed for PC/SC."

Courses by Year/Term:

Year 1
- Fall A: MA 1021 Calculus 1; PH 1110 Mechanics; FY 1100 Great Problems Seminar (GPS)*
- Fall B: MA 1022 Calculus 2; AR 2114 Modern Architecture in the American era; FY 1100 Great Problems Seminar (GPS)*
- Spring C: MA 1023 Calculus 3; CH 1010 Chemical Properties and Bonding; H&A, SS, free elective
- Spring D: MA 1024 Calculus 4; PH 2101 Thermodynamics; AREN 2023 Introduction to Architectural Engineering Systems

Year 2
- Fall A: AREN 2002 Architectural Design I; MA 2051 Ordinary differential equations; CE 2000 Analytical Mechanics 1
- Fall B: AREN2004 Architectural Design II - Light and Lighting systems; ER 3004 Fluid Mechanics; CE 2001 Analytical Mechanics 2
- Spring C: MA 2071 Matrixes and Linear Algebra; AREN 3024 Building Physics; CE 2002 Introduction to analysis and design
- Spring D: AREN 3002 Architectural Design III; AREN 3003 Introduction to HVAC design; History and Theory Elective

Year 3
- Fall A: AREN 3020 Architectural Design IV - Building Energy Simulation; History and Theory of Architecture Elective; History and Theory Elective
- Fall B: AREN 3006 Advanced HVAC design; CE 3008 Design or reinforced concrete structures; History and Theory of Architecture Elective
- Spring C: AREN 3022 Architectural Design V - Building Envelope Design; CE 3006 Design of steel structures; ID 2050 Preparation for IQP
- Spring D: Interactive Qualifying Project (IQP)

Year 4
- Fall A: CE 3022 Legal specs of Professional Practice; History and Theory of Architecture Elective; Major Qualifying Project (MQP)
- Fall B: CE 4071 Land Use Development and Controls; H&A, SS, free elective; Major Qualifying Project (MQP)
- Spring C: MA 2611 Applied Statistics; ARCH 500 Thesis Research seminar; Major Qualifying Project (MQP)
- Spring D: AREN 2025 Building Electrical Systems; H&A, SS, free elective; Topical Elective; Physical Education

Year 5
- Fall: ARCH 599 Thesis Design; Topical Elective; Topical Elective
- Spring: ARCH 599 Thesis Design; Professional Practice; CE 501 Professional Practice Elective

Non-Curricular Activities
- Guest Lecture Series
- Day in Practice
- NCAR AXP/ALA
- Professional Practitioner Involvement
- Student Design Portfolio

Shared Values
- Design
- Env. Stewardship and Prof. Respon.
- Equity, Diversity, and Inclusion:
- Knowledge and Innovation
- Leadership, Collab. & Comm. Engmt.
- Lifelong Learning

Program Criteria
- PC.1 Career Paths
- PC.2 Design
- PC.3 Ecolog. Knowl. & Respon.
- PC.4 History and Theory
- PC.5 Research and Innovation
- PC.6 Leadership and Collaboration
- PC.7 Learning and Teaching Culture
- PC.8 Social Equity and Inclusion

Student Criteria
- SC.1 HSW in the Built Env.
- SC.2 Professional Practice
- SC.3 Regulatory Context
- SC.4 Technical Knowledge
- SC.5 Design Synthesis
- SC.6 Building Integration

■ Assessed for PC/SC

4—Curricular Framework

This condition addresses the institution's regional accreditation and the program's degree nomenclature, credit-hour and curricular requirements, and the process used to evaluate student preparatory work.

4.1 Institutional Accreditation

The APR must include a copy of the most recent letter from the regional accrediting commission/agency regarding the institution's term of accreditation.

Program Response:

Worcester Polytechnic Institute is accredited by the New England Commission of Higher Education (NECHE). The most recent letter re-affirming accreditation was issued on April 7, 2022. The next comprehensive evaluation will be scheduled for Fall 2031. Please see appendix X for a copy of the most recent letter from NECHE.

4.2 Professional Degrees and Curriculum

The NAAB accredits professional degree programs with the following titles: the Bachelor of Architecture (B. Arch.), the Master of Architecture (M. Arch.), and the Doctor of Architecture (D. Arch.). The curricular requirements for awarding these degrees must include professional studies, general studies, and optional studies.

4.2.1 Professional Studies. Courses with architectural content required of all students in the NAAB-accredited program are the core of a professional degree program that leads to licensure. Knowledge from these courses is used to satisfy Condition 3—Program and Student Criteria. The degree program has the flexibility to add additional professional studies courses to address its mission or institutional context. In its documentation, the program must clearly indicate which professional courses are required for all students.

Programs must include a link to the documentation that contains professional courses are required for all students.

Program Response:

Professional Studies comprise the majority of credit hours in the 171-credit hour program. The Professional Studies requirement for the Master of Architecture program includes 90 semester credit hours as shown in the table below.

Professional Studies Overview Table

Professional Studies Requirement Master of Architecture Program			
Undergraduate			
Architectural Design Studio	AREN 2002	Architectural Design I	3
	AREN 2004	Architectural Design II - Light and Lighting systems	3
	AREN 3002	Architectural Design III	3
	AREN 3020	Architectural Design IV - Building Energy Simulation	3
	AREN 3022	Architectural Design V - Building Envelope Design	3
Major Qualifying Project (Undergraduate Capstone Design Project)	MQP	Major Quallifying Project	3
	MQP	Major Quallifying Project	3
	MQP	Major Quallifying Project	3
Materials and Methods of Construction	AREN 2023	Introduction to Architectural Engineering Systems	3
Building Structural Systems	CE 2000	Analytical Mechanics 1	3
	CE 2001	Analytical Mechanics 2	3
	CE 2002	Introduction to analysis and design	3
Building Structural Systems (Students are required to select at least 2 additional	CE 3006	Design of steel structures	6
	CE 3008	Design or reinforced concrete structures	
	CE 3010	Structural engineering	

Professional Studies Overview Table - continued

Professional Practice (Students are required to select at least 2 courses from	CE 3025	Project Evaluation	6
	CE 3020	Project Management	
	CE 3022	Legal Aspects of Professional Practice	
Building Mechanical Systems	AREN 3024	Building Physics	3
	AREN 3003	Introduction to HVAC design	3
	AREN 3006	Advanced HVAC design	3
Building Electrical and Lighting	AREN 2025	Building Electrical Systems	3
	AR 2114	Modern Architecture in the American Era, 1750-2001 and beyond	3
Students are required to select at least 2 additional History and Theory courses from this list	AR 2115	Topics in Architecture Since 1960	6
	AR 3112	Modernism, Mass Culture, and the Avant-Garde	
	CE 3070	Urban and Environmental Planning	
	CE 4071	Land use Development and Controls	
	ENV 2201	Planning for Sustainable Communities	
	ENV 2710	Designing for Climate Resilience and Justice	
	ENV 3100	Adventures in Sustainable Urbanism	
	HI 1311	Introduction to American Urban History	
	HI 2310	Topics in Urban History	
	HI 331X	Urban Ecology and Environmental Justice	
	IGS 501	Theorizing Place, Community, and Global Environmental Change	
Graduate			
Research Seminar	ARCH 500	Thesis Research Seminar	3
PROFESSIONAL PRACTICE (2 courses)	CE 501	Professional Practice	3
		Required Professional Practice Elective	3
DESIGN THESIS	ARCH 599	Design Thesis	12
		TOTAL credit hours requirement Profesional Studies	**90**

The requirements for WPI's M. Arch program can be found at:
https://www.wpi.edu/academics/study/master-architecture

4.2.2 General Studies. An important component of architecture education, general studies provide basic knowledge and methodologies of the humanities, fine arts, mathematics, natural sciences, and social sciences. Programs must document how students earning an accredited degree achieve a broad, interdisciplinary understanding of human knowledge.

In most cases, the general studies requirement can be satisfied by the general education program of an institution's baccalaureate degree. Graduate programs must describe and document the criteria and process used to evaluate applicants' prior academic experience relative to this requirement. Programs accepting transfers from other institutions must document the criteria and process used to ensure that the general education requirement was covered at another institution.

Programs must state the minimum number of credits for general education required by their institution <u>and</u> the minimum number of credits for general education required by their institutional regional accreditor.

Program Response:

Worcester Polytechnic Institute is accredited by the New England Commission of Higher Education, which requires the institution to ensure that all undergraduate students complete at least the equivalent of 40 semester credits in general education. WPI's academic requirements are specifically designed to develop an overall educational experience which meets the goals of the college, the minimum general education requirements for WPI exceed the min NECH requirements, and the institute requires:

- The Humanities and Arts Requirement   min. 18 semester credit hours (2 units)
- Mathematics and Science Requirement   min. 18 semester credit hours (2 units)
- The Interactive Qualifying Project   min. 9 semester credit hours (1unit)
- Social Sciences   min. 6 semester credit hours (2/3unit)
- Physical Education   min. 3 semester credit hours (1/3unit)
     Total min. General Education @WPI: min. 54 semester credit hours (6 units)

In addition to WPI's minimum general studies requirements, individual programs can have additional requirements. The general studies requirement for the Master of Architecture program includes 69 semester credit hours, as shown in the table below.

General Studies Overview Table

General Studies Requirement Master of Architecture Program			
Mathematics	MA 1021	Calculus 1	3
	MA 1022	Calculus 2	3
	MA 1023	Calculus 3	3
	MA 1024	Calculus 4	3
	MA 2051	Ordinary differential equations	3
	MA 2071	Matrixes and Linear Algebra	3
	MA 2611	Applied Statistics	3
Basic Science	CH 1010	Chemical Properies and Bonding	3
	PH 1110	Mechanics	3
	PH 1120	Electricity and Magnetism	3
Supplemental Science	PH 2101	Thermodynamics	3
	ER 3004	Fluid Mechanics	3
Humanities and Arts	HU 3900	Inquiry Seminar	3
		HUA electives	12
Social Sciences		SS Electives	6
Interactive Qualifying Project		Interactive Qualifying Project	9
Physical Education			3
		TOTAL credit hours requirement General Studies	**69**

The requirements for WPI's M. Arch program can be found at:
https://www.wpi.edu/academics/study/master-architecture

4.2.3 Optional Studies. All professional degree programs must provide sufficient flexibility in the curriculum to allow students to develop additional expertise, either by taking additional courses offered in other academic units or departments, or by taking courses offered within the department offering the accredited program but outside the required professional studies curriculum. These courses may be configured in a variety of curricular structures, including elective offerings, concentrations, certificate programs, and minors.

The program must describe what options they provide to students to pursue optional studies both within and outside of the Department of Architecture.

Program Response:
The M. Arch curriculum includes flexibility for optional studies by reserving 12 semester credit hours for elective courses.

At the graduate level, the design thesis is underpinned by elective courses that are thematically aligned with a focus area, allowing students to broaden their skills and develop a meaningful grasp of a thematic area of interest. To ensure this depth, students complete at least three courses of thematically related work. Different focus areas are possible and currently include a focus on (1) structures, and (2) climate adaptation. Other focus areas can be developed, and

students can propose alternative thematically related coursework with sponsorship from a thesis advisor and approval of the M. Arch program committee. The focus area is seen as an important mechanism to connect the graduate program with faculty from other research domains and programs across campus. A list of recommended courses for two exemplary focus areas is included below:

Focus area – Structures.
CE 524: Finite Element Method and Applications
CE 510: Structural Mechanics
CE 511: Structural Dynamics
CE 514/ME 5383: Continuum Mechanics
CE 519: Advanced Structural Analysis
CE 531: Advanced Design of Steel Structures
CE 532: Advanced Design of Reinforced Concrete Structures
CE 534: Structural Design for Fire Conditions
CE/ME 5303: Applied Finite Element Methods in Engineering

Focus area – Climate Adaptation.
IGS 501: Theorizing Place, Community, and Global Environmental Change
IGS 505: Qualitative Methods for Community-Engaged Research
IGS 510: Human Dimensions of Global Environmental Change
IGS 545: Climate Change: Vulnerability and Mitigation
IGS 590: Capstone Seminar: Comparative Climate Action

At the undergraduate level, students have flexibility to complete elective courses in academic areas of interest. Note that the General Studies requirements at WPI are specifically structured to offer substantial flexibility – i.e. the WPI curriculum plan is not very prescriptive. This allows students to pursue various minors, for example.

The requirements for WPI's M. Arch program can be found at:
https://www.wpi.edu/academics/study/master-architecture

NAAB-accredited professional degree programs have the exclusive right to use the B. Arch., M. Arch., and/or D. Arch. titles, which are recognized by the public as accredited degrees and therefore may not be used by non-accredited programs.

Programs must list all degree programs, if any, offered in the same administrative unit as the accredited architecture degree program, especially pre-professional degrees in architecture and post-professional degrees.

Program Response:
The only NAAB-accredited degree offered at WPI is a Master of Architecture. The Master of Architecture Program is housed within the Civil, Environmental, and Architectural Engineering Department at WPI, which also offers the following programs of study:

- **Bachelor of Science in Architectural Engineering**
  135 semester credit hours ABET accredited Engineering degree program.
- **Bachelor of Science in Civil Engineering**
  135 semester credit hours ABET accredited Engineering degree program.
- **Bachelor of Science in Environmental Engineering**
  135 semester credit hours ABET accredited Engineering degree program.
- **Master of Science in Civil Engineering** (min. 30 semester credit hours)
- **Master of Engineering in Civil Engineering** (min. 30 semester credit hours)
- **Master of Science in Environmental Engineering** (min. 30 semester credit hours)
- **Master of Science in Construction Project Management** (min. 30 sem. credit hours)
- **Certificate in Construction Project Management** (min. 12 semester credit hours)

- **Minor in Architectural Engineering** (min. 18 semester credit hours)
- **Master of Science in Community Climate Adaptation** (min. 30 semester credit hours)

- **Doctor of Philosophy** The CEAE PhD program supports graduate research in civil, environmental and architectural engineering topics.

The table below provides an overview of all programs offered in the CEAE Department.

Area of Study ▼	Bachelor ▼	Minor ▼	Certificate ▼	Master ▼	PhD ▼
Architectural Engineering	BACHELOR	MINOR			
Architecture				MASTER	
Civil Engineering	BACHELOR			MASTER	PHD
Civil Engineering (MEng)				MASTER	
Community Climate Adaptation				MASTER	
Construction Project Management			CERTIFICATE	MASTER	
Environmental Engineering	BACHELOR			MASTER	

The number of credit hours for each degree is outlined below. All accredited programs must conform to minimum credit-hour requirements established by the institution's regional accreditor. Programs must provide accredited degree titles, including separate tracks.

4.2.4 Bachelor of Architecture. The B. Arch. degree consists of a minimum of 150 semester credit hours, or the quarter-hour equivalent, in academic coursework in general studies, professional studies, and optional studies, all of which are delivered or accounted for (either by transfer or articulation) by the institution that will grant the degree. Programs must document the required professional studies courses (course numbers, titles, and credits), the elective professional studies courses (course numbers, titles, and credits), the required number of credits for general studies and for optional studies, and the total number of credits for the degree.

Program Response:
Not applicable

4.2.5 Master of Architecture. The M. Arch. degree consists of a minimum of 168 semester credit hours, or the quarter-hour equivalent, of combined undergraduate coursework and a minimum of 30 semester credits of graduate coursework. Programs must document the required professional studies classes (course numbers, titles, and credits), the elective professional studies classes (course numbers, titles, and credits), the required number of credits for general studies and for optional studies, and the total number of credits for both the undergraduate and graduate degrees.

Program Response:
WPI offers the Master of Architecture Program, which is comprised of a minimum of 171 semester credit hours of combined undergraduate and graduate coursework, with a minimum of 30 semester credits of graduate level coursework. The program requires 90 semester credit hours of Professional Studies, 69 semester credit hours of General Studies, and 12 semester credit hours of Optional Studies, distributed as shown in the table below:

NAAB

Master of Architecture Curriculum Overview Table

			Undergraduate Course Requirements	Credit Hours	Course Type	Professional Studies (PS)	General Studies (GS)	Optional Studies (OS)
Mathematics, Sciences, and Suplemental Sciences	Mathematics	MA 1021	Calculus 1	3	GS		3	
		MA 1022	Calculus 2	3	GS		3	
		MA 1023	Calculus 3	3	GS		3	
		MA 1024	Calculus 4	3	GS		3	
		MA 2051	Ordinary differential equations	3	GS		3	
		MA 2071	Matrixes and Linear Algebra	3	GS		3	
		MA 2611	Applied Statistics	3	GS		3	
	Basic Science	CH 1010	Chemical Properies and Bonding	3	GS		3	
		PH 1110	Mechanics	3	GS		3	
		PH 1120	Electricity and Magnetism	3	GS		3	
	Supplemental Science	PH 2101	Thermodynamics	3	GS		3	
		ER 3004	Fluid Mechanics	3	GS		3	
Architectural and Engineering Design	Architectural Design Studios	AREN 2002	Architectural Design I	3	PS	3		
		AREN2004	Architectural Design II - Light and Lighting systems	3	PS	3		
		AREN 3002	Architectural Design III	3	PS	3		
		AREN 3020	Architectural Design IV - Building Energy Simulation	3	PS	3		
		AREN 3022	Architectural Design V - Building Envelope Design	3	PS	3		
	Major Qualifying Project (Undergraduate Capstone Design Project)	MQP	Major Qualifying Project	3	PS	3		
		MQP	Major Qualifying Project	3	PS	3		
		MQP	Major Qualifying Project	3	PS	3		
Building Engineering and Technology	Materials and Methods of Construc	AREN 2023	Introduction to Architectural Engineering Systems	3	PS	3		
	Building Structural Systems	CE 2000	Analytical Mechanics 1	3	PS	3		
		CE 2001	Analytical Mechanics 2	3	PS	3		
		CE 2002	Introduction to analysis and design	3	PS	3		
	Building Structural Systems (Students are required to select at least 2 additional	CE 3006	Design of steel structures		PS			
		CE 3008	Design or reinforced concrete structures	6	PS	6		
		CE 3010	Structural engineering		PS			
	Professional Practice (Students are required to select at least 2 courses from	CE 3025	Project Evaluation		PS			
		CE 3020	Project Management	6	PS	6		
		CE 3022	Legal Aspects of Professional Practice		PS			
	Building Mechanical Systems	AREN 3024	Building Physics	3	PS	3		
		AREN 3003	Introduction to HVAC design	3	PS	3		
		AREN 3006	Advanced HVAC design	3	PS	3		
	Building Electrical and Lighting	AREN 2025	Building Electrical Systems	3	PS	3		
History and Theory of Architecture		AR 2114	Modern Architecture in the American Era, 1750-2001 and beyond	3	PS	3		
	Students are required to select at least 2 additional History and Theory courses from this list	AR 2115	Topics in Architecture Since 1960					
		AR 3112	Modernism, Mass Culture, and the Avant-Garde					
		CE 3070	Urban and Environmental Planning					
		CE 4071	Land use Development and Controls					
		ENV 2201	Planning for Sustainable Communities	6	PS	6		
		ENV 2710	Designing for Climate Resilience and Justice					
		ENV 3100	Adventures in Sustainable Urbanism					
		HI 1311	Introduction to American Urban History					
		HI 2310	Topics in Urban History					
		HI 331X	Urban Ecology and Environmental Justice					
		IGS 501	Theorizing Place, Community, and Global Environmental Change					
General Studies	Humanities and Arts	HU 3900	Inquiry Seminar	3	GS		3	
			HUA electives	12	GS		12	
	Social Sciences		SS Electives	6	GS		6	
	Interactive Qualifying Project		Interactive Qualifying Project	9	GS		9	
	Physical Education			3	GS		3	
	Free Electives			3	OS			3
			UNDERGRADUATE Semester Credit Hours TOTAL	**141**		**69**	**69**	**3**

			Graduate Course Requirements	Credit Hours	Type	Professional Studies (PS)	General Studies (GS)	Optional Studies (OS)
Research Seminar		ARCH 500	Thesis Research Seminar	3	PS	3		
PROFESSIONAL PRACTICE (2 courses)		CE 501	Professional Practice	3	PS	3		
			Required Professional Practice Elective	3	PS	3		
FOCUS ELECTIVES			Focus Elective	3	OS			3
			Focus Elective	3	OS			3
			Focus Elective	3	OS			3
DESIGN THESIS		ARCH 599	Design Thesis	12	PS	12		
			GRADUATE Semester Credit Hours TOTAL	**30**		**21**		**9**

		Credit Hours	TOTAL Professional Studies (PS)	General Studies (GS)	Optional Studies (OS)
TOTAL semester credit hours of combined undergraduate and graduate coursework		**171**	**90**	**69**	**12**

PS = Professional Studies
GS = General Studies
OS = Optional Studies

The curriculum overview is available to students at the program's website:
https://www.wpi.edu/academics/study/master-architecture#requirements
(Open link and then browse to open "M. Arch Course Requirements").

4.2.6 Doctor of Architecture. The D. Arch. degree consists of a minimum of 210 credits, or the quarter-hour equivalent, of combined undergraduate and graduate coursework. The D. Arch. requires a minimum of 90 graduate-level semester credit hours, or the graduate-level 135 quarter-hour equivalent, in academic coursework in professional studies and optional studies. Programs must document, for both undergraduate and graduate degrees, the required professional studies classes (course numbers, titles, and credits), the elective professional studies classes (course numbers, titles, and credits), the required number of credits for general studies and for optional studies, and the total number of credits for the degree.

Program Response:
Not applicable

4.3 Evaluation of Preparatory Education

The NAAB recognizes that students transferring to an undergraduate accredited program or entering a graduate accredited program come from different types of programs and have different needs, aptitudes, and knowledge bases. In this condition, a program must demonstrate that it utilizes a thorough and equitable process to evaluate incoming students and that it documents the accreditation criteria it expects students to have met in their education experiences in non-accredited programs.

4.3.1 A program must document its process for evaluating a student's prior academic coursework related to satisfying NAAB accreditation criteria when it admits a student to the professional degree program.

See also Condition 6.5

Program Response:

Entry into the NAAB accredited Master of Architecture program can occur in different ways. We expect most students to enter the 4+1 integrated track, starting as first year students in the 4-year Bachelor of Science in Architectural Engineering, before gaining admission to the one-year Master of Architecture program. We expect that some students may also transfer into the 4+1 integrated track – but this will typically not be later than the second year. For applicants that already possess a bachelor's degree, these can be admitted with direct matriculation to the Master of Architecture degree and the duration of study for these applicants will be specified on a case-by-case basis. This process entails evaluating their previous education and experiences, and developing a plan of study that assures they meet all PC/SCs.

The admission criteria are as follow:

B.S. Architectural Engineering Admission
Admissions to the B.S. in Architectural Engineering is entirely handled by the WPI admission office, which uses the Common App. Starting with the 2025-2026 application cycle, applicants to our BS AREN program will have the option to indicate their interest to pursue the 4+1 integrated B.S. AREN / M. Arch. track in the Common App. More information can be found at: https://www.wpi.edu/admissions/undergraduate/apply/application-options

M. Arch Admission Criteria for WPI B.S AREN students.
Prospective undergraduate students interested in the combined 4+1 B.S. AREN/ M. Arch. program can indicate this on their undergraduate application but are required to formally apply to the M. Arch program during the Fall semester of their junior year. Admission to the program for these students is decided by the program committee on a case-by-case basis. The following items are required before a decision for admission can be made:

- A complete online WPI application for graduate school,
- Have earned, or be in good standing towards earning, a BS in Architectural Engineering at WPI (a GPA of 3.0 is typically expected as a minimum),
- Submit a portfolio of creative work,
- Submit a Resume,
- Submit a statement of goals,
- Provide three Letters of recommendations, with one from a relevant non-academic source.

All elements of the application are important and will be used in making decisions for admission. The portfolio of creative work is important in evaluating a student's ability to undertake graduate design work. The resume, statement of goals, and letters of reference are useful in assessing students' professional aptitudes, interests, and readiness for pursuing the professional Master of Architecture degree program. This admission track offers the advantage of students being "known" to the program, since they have been in the BS AREN program for two years and have already completed several design studios and other coursework with program faculty. If a student is not accepted into the Master of Architecture program or elects not to apply to the M. Arch program, he/she will earn the B.S. AREN degree upon successful completion of all requirements for the ABET accredited engineering program. The normal residency for the combined BS AREN/ M. Arch. Program track is one year in addition to the four years required for the BS AREN degree. (5-years total).

Please Note that the program is planning on initiating an honors program that allows applicants to be admitted directly into the integrated 4+1 track as part of the undergraduate admission process. In addition to WPIs general admission requirements for undergraduate engineering programs, the program will require additional application materials such as a portfolio of creative work and a statement of goals. These elements will be evaluated for evidence of creativity, self-motivation, and problem-solving abilities before deciding for admission. Admission to the honors track will be made by the program, with additional input from WPIs admission office.

<u>M. Arch Admission Criteria for students with a non-WPI Architectural Engineering degree</u>.
This admission option is intended for those applicants that have earned a baccalaureate degree from other majors at WPI or from other institutions. For most students, this track requires two years of preparatory work before starting the final master thesis year. Students will receive a custom curriculum plan to ensure they meet all the requirements for the Master of Architecture degree program. Courses and work from the candidate's prior degree program are reviewed for conformance to the degree requirements for the Master of Architecture program. This review is considered, in combination with a candidate's professional experience and portfolio of creative work, to determine additional coursework needed to assure that candidates are well rounded and that their program of study satisfies all NAAB P/SCs.

In general, none of the required 30 credit hours of graduate level courses in the M. Arch curriculum are allowed to be transferred from other institutions.

Course Evaluation for Transfer Equivalency & Studio Placement:
For transfer of design and engineering courses (professional studies), faculty members with subject matter expertise are consulted in the evaluation of the course syllabi, learning outcomes, learning objectives, and course work assignments for equivalency to WPI course content. For transfer of other courses (general and optional studies), the university transfer team consults subject matter experts in the relative fields to determine course equivalencies in keeping with the WPI process for transfer of credit, which is available at. https://www.wpi.edu/offices/registrar/policies-procedures/transfer-credit . A review of a student's transcript and portfolio of creative work by the program committee will be used to determine placement in the design studio sequence.

4.3.2 In the event a program relies on the preparatory education experience to ensure that admitted students have met certain accreditation criteria, the program must demonstrate it has established standards for ensuring these accreditation criteria are met and for determining whether any gaps exist**.**

Program Response:
Not applicable

4.3.3 A program must demonstrate that it has clearly articulated the evaluation of baccalaureate-degree or associate-degree content in the admissions process, and that a candidate understands the evaluation process and its implications for the length of a professional degree program before accepting an offer of admission.

Program Response:
The transfer process and requirements are described in section 4.3.1, policies and procedures are found at: https://www.wpi.edu/offices/registrar/policies-procedures/transfer-credit

The student body of WPIs Architectural Engineering and Master of Architecture programs is relatively small, each student's application will therefore be considered on a case-by-case basis by the program committee. All applicants are required to meet with the program director and faculty advisor prior to registration, where they review a custom curriculum plan designed specifically for them. The plan becomes part of the individual student's record and confirms that all accreditation requirements will be met upon successful completion of the plan. When accepted into the program, each student will work with a dedicated program and thesis advisor. Each semester, students meet with their advisor to specifically track their progress and confirm that the degree requirements will be met.

To aid in the applicant evaluation process, the program will utilize a program admission-review-form for all Master of Architecture applications. The form will include a rubric to evaluate application materials. The form will be used for admission purposes only, while the individually tailored M. Arch curriculum plan will be used for officially evaluating placement in the program.

5—Resources

5.1 Structure and Governance
The program must describe the administrative and governance processes that provide for organizational continuity, clarity, and fairness and allow for improvement and change.

5.1.1 Administrative Structure: Describe the administrative structure and identify key personnel in the program and school, college, and institution.
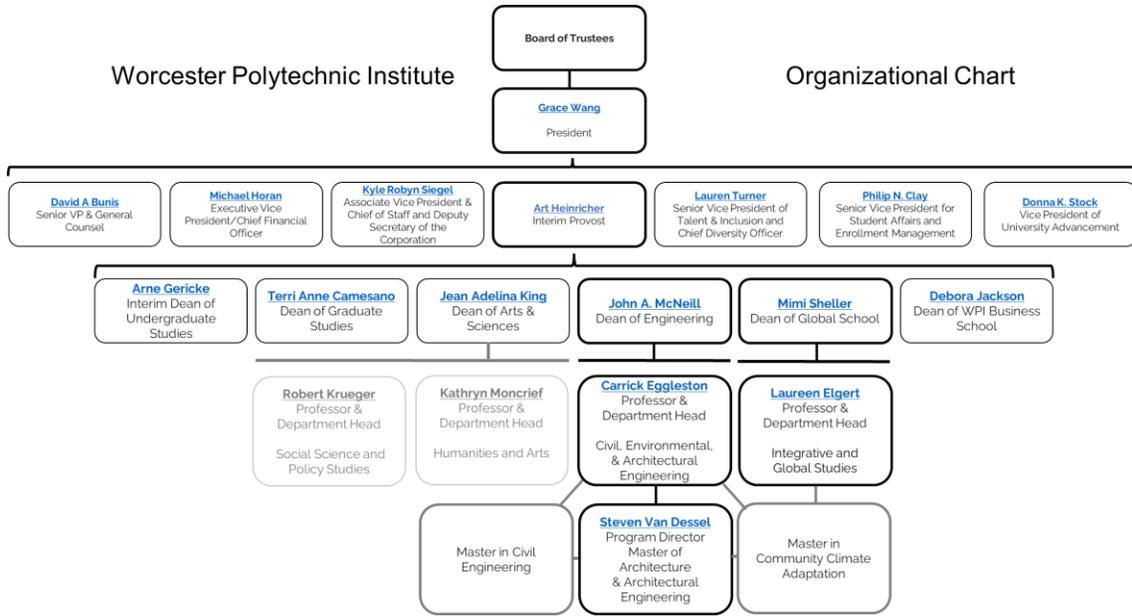
Program Response:
The ultimate authority for governing the University rests with the WPI Board of Trustees. Composed of a minimum of 12 members, the Board currently has 37 trustees and 43 non-voting emeriti members.

The President is the chief executive officer of WPI responsible for all of WPI's affairs. The President is a Trustee and a member of the Faculty. It is the duty of the President to see to it that the standards and procedures in operational use within WPI conform to the policy established by the Board and to the standards of sound academic practice.

The Provost is WPI's chief academic officer after the President and is a member of the Faculty. In consultation with the Deans, Department Heads and members of the Faculty, the Provost takes initiative in proposing plans and actions in academic matters, in reviewing and implementing educational programs and policies.

Academic Deans are members of the Faculty, reporting to the Provost, charged with responsibility to operate WPI's academic programs. The Provost may also appoint other academic deans and administrators, including but not limited to deans of Undergraduate Studies and Graduate Studies, and a Vice-Provost for Research. Each School's budget is under the control of the Dean. The Provost assigns duties and responsibilities to the Academic Deans. The academic structure of WPI consists of the following Schools: The School of Arts and Sciences; The School of Engineering; The Business School; and The Global School.

The faculty is understood to consist of such people as shall be designated in the Faculty Constitution and Faculty Bylaws and approved by the Board. Faculty members report to their respective Department Head and/or Program Director, as applicable. The WPI faculty are primarily responsible for advancing WPI's academic mission through instruction and expanding the boundaries of knowledge through scholarship and research. Faculty members also play critical service roles within and outside of WPI. The roles, responsibilities, and rights of faculty are documented in the WPI Faculty Handbook.

Worcester Polytechnic Institute — Organizational Chart

Board of Trustees

Grace Wang
President

| David A Bunis
Senior VP & General Counsel | Michael Horan
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Associate Vice President & Chief of Staff and Deputy Secretary of the Corporation | Art Heinricher
Interim Provost | Lauren Turner
Senior Vice President of Talent & Inclusion and Chief Diversity Officer | Philip N. Clay
Senior Vice President for Student Affairs and Enrollment Management | Donna K. Stock
Vice President of University Advancement |

| Arne Gericke
Interim Dean of Undergraduate Studies | Terri Anne Camesano
Dean of Graduate Studies | Jean Adelina King
Dean of Arts & Sciences | John A. McNeill
Dean of Engineering | Mimi Sheller
Dean of Global School | Debora Jackson
Dean of WPI Business School |

Robert Krueger
Professor & Department Head
Social Science and Policy Studies

Kathryn Moncrief
Professor & Department Head
Humanities and Arts

Carrick Eggleston
Professor & Department Head
Civil, Environmental, & Architectural Engineering

Laureen Elgert
Professor & Department Head
Integrative and Global Studies

Master in Civil Engineering

Steven Van Dessel
Program Director
Master of Architecture & Architectural Engineering

Master in Community Climate Adaptation

5.1.2 Governance: Describe the role of faculty, staff, and students in both program and institutional governance structures and how these structures relate to the governance structures of the academic unit and the institution.

Program Response:

Program Level Governance: The AREN and M. Arch faculty fully participate in the governance of the program. The small size of the program accommodates a collaborative approach to program governance that has evolved quite organically, and shared governance has been an inherent part of our program's day-to-day operations. Program members typically meet at the program's bi-weekly program committee meeting where major decisions are made by majority vote. The program faculty also meet with their colleagues at the department level faculty meeting, which typically also meets on a bi-weekly schedule. These meetings include faculty from the Civil and Environmental Engineering programs, which also contribute courses to our M. Arch curriculum. All 3 programs (Architecture, Civil, Environmental) are located in Kaven Hall, the program scale and physical proximity of our faculty facilitates our shared governance approach across these programs at the department level. An overview of collective governance activities is provided below:

- Annual Program retreat
- Annual Departmental retreat
- Bi-weekly Program meetings
- Bi-weekly Departmental faculty meetings
- Annual program advisory board meetings
- Annual departmental advisory board meetings
- One-on-one meetings between faculty and department head (annual)
- One-on-one meetings between program director and department head (annual)
- One-on-one meetings between department head and dean of engineering (annual)
- Bi-weekly meetings between Department Head (DH) / Program Directors (PD) and the Dean of Engineering
- Annual School of Engineering Retreat with DHs and PDs.

In addition to faculty interactions, the program invites student representatives to select program meetings and faculty retreat to solicit their input. The students hold an election each year to

appoint representatives, typically one member from each graduating class. Staff members can also be invited select program meetings as needed, although most collaboration between faculty and staff are at the department level.

University Level Governance: Policies and procedures regarding the responsibilities and authority of the Faculty at WPI in academic and governance matters are found in the WPI Faculty Handbook. The Faculty accepts duties and responsibilities and derives its authority in accordance with the Bylaws of WPI under the direction of the Board of Trustees. The Board of Trustees, in turn, delegates the areas of responsibility and authority to the Faculty through the President of WPI. In accordance with accepted practices at institutions of higher learning in the United States, areas of duty, responsibility, authority, and academic freedom are understood as follows:

Duties: The duties of the Faculty shall include, but not be limited to, the establishment of admission requirements, academic standards, curricula, courses of study, and the regulations pertaining thereto, as well as the certification of candidates for degrees and recommendation to the Board of Trustees for award of degrees.

Responsibilities: The Faculty has a responsibility for initiating, considering, and making recommendations on questions of educational policy and problems arising therefrom. A question is one of educational policy to the extent that it bears upon conditions facilitating instruction, study, research, publication, and other scholarly or cultural activities of faculty members and students.

Authority: The Faculty, subject to approval of the Board of Trustees, defines the recognized titles of academic rank at WPI, and the criteria of eligibility thereto, and has such authority over the academic policies and programs as may be delegated to it by the President and the Board of Trustees.

Academic Freedom:

A. Faculty Members are entitled to full freedom in research and in the publication of the results, subject to the adequate performance of other academic duties; but research for pecuniary return should be in accordance with established WPI policy.

B. Faculty Members are entitled to freedom in the classroom in discussing their subjects and evaluating their students, but they should be careful not to introduce into their teaching controversial matters which have no relation to their subjects.

C. College and university faculty members are citizens, members of learned professions, and officers of an educational institution. When they speak or write as citizens, they should be free from institutional censorship or discipline, but their special position in the community imposes special obligations. As persons of learning and as educational officers, they should remember that the public may judge their profession and institution by their utterances. Hence, they should at all times be accurate, should exercise appropriate restraint, should show respect for the opinions of others, and should make every effort to indicate that they are not institutional spokespersons.

D. All members of the WPI Faculty, whether they are tenured, are on the tenure track during their probationary period, or hold secured or short-term nontenure-track appointments, have academic freedom. As members of the WPI Faculty, they are guaranteed nonretaliation with respect to appointment decisions and other conditions of employment for exercising the full range of academic freedom in all their contributions to the University including participation in

its governance. Their right to express their views without reprisal is secured by access to all procedures described in the Faculty Handbook.

Standing Committees of the Faculty

Committees of the Faculty are created by Bylaws of the Faculty and are responsible to the Faculty. Standing Committees are charged with broad issues of continuing faculty concern, and, once created, maintain their existence until expressly abolished by the Faculty. Ad hoc Committees may be created by the Faculty to serve specific purposes and to exist for a designated period of time. The standing Committees of the Faculty are the following:

I.   The Committee on Governance (COG)
II.   The Committee on Academic Policy (CAP)
III.   The Committee on Academic Operations (CAO)
IV.   The Committee on Graduate Studies and Research (CGSR)
V.   The Committee on Tenure and Academic Freedom (CTAF)
VI.   The Committee on Appointments and Promotions (COAP)
VII.   The Committee on Advising and Student Life (CASL)
VIII.   The Committee on Financial and Administrative Policy (FAP)
IX.   The Faculty Review Committee
X.   The Undergraduate Outcomes Assessment Committee (UOAC)

Program faculty actively participate as elected members in various capacities (chair, member) for most standing committees of the faculty

Staff Council
The WPI Staff Council is the voice of the employees at the university. Members are elected by their peers to advocate for and act as a collective voice for the interests and needs of WPI's non-union staff. Having a staff council helps foster a positive and inclusive environment at WPI and offers informed support and resource for staff members. Through programs, resource sharing, and communication, the Staff Council represents a diverse range of staff while working for the improvement of the campus community. As a platform to foster open communication, it serves as an important advisory role on matters of interest and concern while supporting WPI's mission, values, and strategic goals. The council responsibilities include but are not limited to:
·   Championing staff success
·   Assisting with evaluating policies and procedures affecting staff
·   Developing plans for staff recognition and celebrations
·   Acting as a resource for staff questions
·   Advocating for staff concerns

5.2 Planning and Assessment
The program must demonstrate that it has a planning process for continuous improvement that identifies:

5.2.1 The program's multiyear strategic objectives, including the requirement to meet the NAAB Conditions, as part of the larger institutional strategic planning and assessment efforts.

Program Response:

WPI's Strategic Plan: Lead with Purpose.
The planning for Lead With Purpose: WPI 2021-2026 began before the pandemic, continued through the early days of it in 2020, and was influenced by it—with leadership and the WPI community at-large recognizing that COVID-19 has dramatically shifted the landscape of higher education. With this plan, WPI aims to respond. Building upon the previous plan, *Elevate*

Impact, WPI's last strategic plan, and while acknowledging the key global trends that impact our work, WPI has focused on the following broad areas in its planning:

- Student Well-Being, Access, and Affordability

- Purpose-Driven Education and Research

- Our Inclusive Community

More than 100 faculty and staff participated in the planning activity, and more than 640 community members provided feedback to early drafts, which helped WPI refine and improve the plan. The plan is available at: https://express.adobe.com/page/u5GGER8SMzYJw/

One of the important objectives of the WPI strategic plan is to engage in purpose driven education and research, which is intended to be accomplished by the following specific goals:

1. Increase our global impact by incorporating online and tech-enabled learning options into WPI's already distinctive, project-based curriculum at the undergraduate level, including cohort models, blended and fully remote options, and online experiential learning.
2. Revolutionize what it means to be a successful STEM professional by integrating important perspectives, experiences, and abilities not traditionally a part of STEM education into the undergraduate curriculum; assess the delivery of our existing undergraduate learning outcomes (technical, human, global/cross-cultural); and integrate pathways to additional foundational capabilities, including business/value creation, art/design, and sustainability/climate change adaptation into the undergraduate experience to prepare our students to be the STEM leaders of the future.
3. Strengthen and grow new, demand-driven graduate programs through differentiated pricing, strategic partnerships, and innovation, including practice-based MS/PhD, graduate programs from The Global School, stackable credentialing, and workforce development.
4. Expand scholarly work at WPI: Grow interdisciplinary discovery and address global challenges such as sustainability, climate change, human health, and socially just technologies, through increased funding, better proposal win rates, and greater student engagement in transformational research for impact on societal problems

Master of Architecture Plan:
Page 74 of the July 19, 1868, issue of The Scientific American magazine includes a short article describing the start of the then new "Worcester County Free Institute of Industrial Science". Scrolling through the magazine, it is quite clear that WPI was founded at a time of rapid change. New processes became available to produce steel, high-rise buildings are invented, reinforced concrete appears, large-scale sanitation and water purification systems are built, and new building technologies become available. The studies listed in the article are reflective of the societal and technological trends and needs of the period, about a third of the course subjects listed in the article are in the broad area of Civil and Architectural Engineering:

> *"Among the studies to be pursued were enumerated mathematics, **surveying, leveling**, physics, and mechanics; mechanical engineering, **civil engineering including drawing, designing, and modelling; architecture**, applied chemistry. metallurgy, geology applied to mining and agriculture, bookkeeping, French, and the science of teaching."*

At the start of WPI the United States had rapidly urbanized; a trend that has continued worldwide until this day alongside an 8-fold increase in world population. Over 50% of the people alive today are living in cities, compared to only a small percentage just two hundred years ago. The infrastructure that allows "modern life" to unfold is in large made possible by the work done by civil, environmental, and architectural engineers and designers. The impact of infrastructure on human well-being and environmental sustainability has also become quite clear. Buildings and other infrastructure consume over 50% of the energy and materials

worldwide, while most people in the US spend 90% of their time indoors or on a road. People also need vast amounts of clean water, which has placed serious strains on many water supplies. The areas of Civil, Environmental and Architectural Engineering remain to play a key role in society, this role is expanding into new directions.

At a polytechnic, the field of architecture is quite at home and the creation of our integrated Master of Architecture program is construed as an important contributing factor in the attainment of several of the abovementioned institute wide goals (see areas highlighted in blue in the above excerpt of the selected WPI strategic plan goals).

The program has been in the making for several years and has grown logically and organically out of the existing architectural engineering program, as described within this report.

The programs long term strategic objectives can be summarized as follows:

- Establish a thriving educational program that seamlessly integrates the architectural and engineering disciplines, building upon strong science-based and humanistic educational foundations.
- Leverage the unique feature of WPI – a project-based education based upon the integration of "Lehr und Kunst".
- Deliver graduates that successfully participate in the Architectural Experience Program and complete the Architectural Registration Exam
- Produce distinct graduates that are broadly employable and successful in the field of Architecture.

The programs short term strategic objectives can be summarized as follows:

- Implement the required curriculum elements at the graduate level in AY 24-25,
- Refine and deploy the student and program criteria assessment instruments,
- Successfully enroll the first cohort for the new master program, AY 24/25,
- Attain initial NAAB accreditation in accordance with the timeline presented in the plan for Achieving Initial Accreditation (copied below), with a January 2028 effective date.

Timeline chart – Plan for Achieving Initial Accreditation:

- 4 years of continued candidacy
- Effective date Initial Accreditation period: January 2028
- Effective date second 2-year candidacy period: January 2026
- Effective date initial 2-year candidacy period: January 2024
- min. 180 days

Years: 2029 | 2028 | 2027 | 2026 | 2025 | 2024 | 2023 | 2022

Academic Years: 2028-2029 | 2027-2028 | 2026-2027 | 2025-2026 | 2024-2025 | 2023-2024 | 2022-2023 | 2021-2022

Milestones:
- Fall 2028 – Initial Accreditation Decision by NAAB
- Fall 2028 – Initial Accreditation Visit by NAAB (Sept-Oct) / Cohort FIVE accepted into 5th year of Program (Fall 2027)
- Spring 2028 – Initial Accreditation APR-IA Submitted to NAAB (due by March 1 of year of visit) / Cohort THREE Predicted Graduation (May 2028)
- Fall 2027 – Request for Initial Accreditation Submitted to NAAB (Due by Sept. 7) / Cohort FOUR accepted into 5th year of Program (Fall 2027)
- December 2026 – Continuance of Candidacy Decision by NAAB / Cohort THREE Predicted Graduation (May 2027)
- Fall 2026 – Continuance of Candidacy Visit by NAAB / Cohort TWO accepted into 5th year of Program (Fall 2026)
- Spring 2026 – Continued Candidacy APR-C Submitted to NAAB / Cohort ONE Predicted Graduation (May 2026)
- December 2024 – Initial Candidacy Decision by NAAB / Cohort TWO accepted into 5th year of Program (Fall 2025)
- Fall 2024 – Initial Candidacy Visit by NAAB / Cohort ONE accepted into 5th year of Program (Fall 2024)
- Spring 2024 – Initial Candidacy APR-C Submitted to NAAB / First offering ARCH 500 (Spring 2025)
- December 2023 – Eligibility Decision by NAAB / New Course Development ARCH 500
- Fall 2023 – Eligibility Visit by NAAB
- September 7, 2023 – Eligibility application and Plan for Achieving Initial Accreditation Submitted to NAAB
- May 2023 – M.Arch Program approved by the WPI faculty, which completes formal WPI process
- April 2023 – M.Arch Proposal Reviewed by Committee on Graduate Studies and Research (CGSR)
- Cohort FOUR Predicted Graduation (May 2029)

Cohorts:
- Cohort ONE – 5th Year | Cohort ONE (recruited from AREN Class of 2024 and 2025)
- Cohort TWO – 5th Year | Cohort TWO (recruited from AREN Class of 2026)
- Cohort THREE – 5th Year | Cohort THREE (recruited from AREN Class of 2027)
- Cohort FOUR – 5th Year | Cohort FOUR (recruited from AREN Class of 2028)
- NCARB 2-year Rule

Institutional Assessment

WPI's system for evaluating its operations and academic programs provides data that is used to improve quality and effectiveness as well as ensure the achievement of its mission and purposes. Evaluation occurs at the university, dean, and department levels, and explicitly includes mechanisms for getting systematic feedback from constituencies. Results are used to inform planning and to make changes in resource allocations and academic program delivery. At the university level, the metrics established through strategic planning are tracked and the results are reviewed annually. The process of strategic planning develops initiatives tied specifically to furthering WPI's mission and purposes, framing new academic initiatives, and identifying resources to support them.

The university also regularly seeks feedback on its programs and academic mission from its constituencies, including current students, alumni, and professional advisors. Advisory boards of industry experts provide feedback at the program, department and school or division level. WPI also seeks external input through regular accreditation reviews, such as those conducted by NECHE, ABET, and AACSB. The university also regularly surveys its alumni and students about their overall WPI experience.

School and Departmental Assessment

At the department and division level, the annual reporting process helps inform progress toward strategic priorities and measures established metrics. Additionally, through an annual report, the head of each department reviews the contributions of its faculty and key departmental staff and then identifies needs and priorities for resource allocation in the coming year. WPI schools and departments participate in accreditation processes or external reviews as required by their respective accrediting bodies with a focus on ensuring a high-quality, effective educational experience for learners.

Program Assessment

The program's approach to assessment is to provide mechanisms for collecting evidence for determining student and program performance, to report the findings in a timely and constructive way, to determine and obtain relevant comparisons for the data received, and to provide anonymity to students as they fill out survey tools. The evidence is used in a circular manner, once reviewed, to modify how we implement the program to foster those skills and abilities deemed important. Through this approach, we aim to have high confidence that we achieve the program and student criteria and have confidence in the data collection process. See section 5.3 for more detail on the assessment processes for attainment of PC and SCs.

5.2.2 Key performance indicators used by the unit and the institution

Program Response:

WPI's motto, Theory and Practice, guides its approach to assessment. Project-based learning shifts the focus from content covered and courses completed to what students can actually do with what we think they have learned. WPI's assessment plans focus primarily on capstone project work where students demonstrate that they can integrate and apply what they have learned, with less focus on the individual courses in the curriculum. The core graduation requirements, for all majors, are projects with learning outcomes that map to the institution's learning outcomes. We define student success as the ability to learn and the ability to put this learning into actions that matter.

The faculty, administration, and students work together to collect and assess data on educational effectiveness. These assessments play a significant role in faculty promotion and tenure, department self-studies, and university-wide discussions on teaching effectiveness and culture. Some of the most recent strategic changes at WPI, including making a global project experience available to all undergraduates and the introduction of The Global School, have been motivated and evaluated by assessment of key learning outcomes. In this, community

members are in constant conversation involving all significant stakeholders in these important formative conversations.

Basic Measures of Student Success
WPI collects data on traditional measures of student success, such as retention and graduation rates as well as employment status upon graduation. These data are shared on the university's public data dashboards, first destination outcomes reports, and on the web. The first-to-second-year retention rate for undergraduate students was 95% or higher, which compares favorably with select peer institutions. The data for underrepresented minority students (URM), Pell grant recipients, first-generation students, women, and international students are also comparable. The six-year graduation rate for full-time undergraduates has ranged from 85% for the fall 2008 cohort to 89% for the fall 2014 cohort. Again, this compares favorably with the published six-year graduation rates for select peers.

The Career Development Center annually collects and reports data on post-graduation statistics. More than 90% of 2019 graduates were employed, in graduate school, on active-duty military, or engaged in volunteer service within six months. This is higher than the national average of 86%. WPI also has an exceptionally high knowledge rate for its graduates: the university knows the employment status of over 97% of bachelor's degree graduates on average For the Class of 2020, the mean annual salary for those seeking employment was just under $73,000, compared to $60,803 for the Class of 2013. This average often appears in "top-10" lists for starting salaries, which is a reflection of success for WPI graduates (as well as the job opportunities in engineering and computer science disciplines). Data for graduates with advanced degrees (master's and PhD) are similar. For master's degree graduates in the Class of 2019, 94.9% were employed, in graduate school, on active-duty military, or engaged in volunteer service.

5.2.3 How well the program is progressing toward its mission and stated multiyear objectives.

Program Response:
The program is pursuing its candidacy status and will be better positioned to assess its progress against its long and short term objectives after (i) enrolling its first graduate students, (ii) teaching graduate courses and advising of thesis projects, and (iii) after refining and implementing the instruments for assessment of attainment of PCs and SCs.

5.2.4 Strengths, challenges, and opportunities faced by the program as it strives to continuously improve learning outcomes and opportunities.

Program Response:
The Master of Architecture program is new; but is also growing out of the ABET accredited undergraduate program in Architectural Engineering. The program has a unique set of strengths, challenges, and opportunities.

Strengths
- The Master of Architecture graduate program has been positively reviewed by the WPI Committee on Graduate Studies and Research (CGSR) and was subsequently unanimously approved by the WPI faculty at large during the May 2023 faculty meeting. This completes the formal process at WPI for establishing a new graduate program.
- The first 4 years of the curriculum are integrated with the curriculum of the Architectural Engineering program, relying on professional courses and studios that have been delivered for many years.
- All new courses needed for the program have been created and have been approved by the faculty.

- The institute wide project-based requirements (GPS, IQP, MQP) lend themselves very well to a project based architectural education that emphasizes the integration of social, environmental, and technological considerations – which we anticipate will be one of the hallmarks of the program.
- The program benefits greatly from collaborating with faculty members from different units at WPI, who already contribute to various teaching areas relevant to the study of architecture. For example, many excellent courses exist on topics such as the history and theory of architecture and urban planning, design, social and environmental justice, climate adaptation, and sustainable community development – to name a few.

Challenges
- While the program benefits significantly from the abovementioned strengths, a concerted effort is also needed to further engrain and promote the program within the larger WPI community and among prospective students. We are planning internal workshops to further align visions and identities for the new program. The first such workshop was held in Spring 2024.
- While the required courses for the program have been created or approved, two courses specifically will need to be developed (ARCH 500 Thesis Research Seminar, and ARCH 501 Design Thesis). The syllabus for ARCH 500 has been developed, and the course will be offered for the first time in Spring 2025.
- The curriculum currently does not include a first-year studio design experience, but students have the option of participating in the Great Problem Seminar as an elective course with a focus on architectural design problems. The program will assess the need for a required first-year studio design experience and may then consider (i) creating a new first year studio course, (ii) continue to utilize the Great Problem Seminar as a vehicle to teach architectural design to first year students, or (iii) reformat a first year AREN introduction course to include exploratory architectural design at a level appropriate for first year architecture students.

Opportunities
- As a Polytechnic Institute with an established and accredited Architectural Engineering program that is design centered, WPI is uniquely placed to offer a program that integrates engineering and architecture. A market study was performed by the WPI office for Academic Affairs to collect evidence to demonstrate market viability and opportunities for differentiation for the proposed integrated M. Arch program. The study concluded that *"WPI would have a distinct edge in terms of curriculum, marketability, and uniquely positioned reputation in STEM."*
- For WPI students, the integrated degree is attractive as it offers career flexibility and broader marketability upon graduation. Upon graduation, alumni can decide to become registered architects, engineers, or both, depending on their career goals and aspirations. A survey was completed in 2020 to solicit interest among existing undergraduate students in Architectural Engineering at WPI. About 90% of the students in the AREN major responded. Of the respondents, about 88% indicated that they were very interested (60%) or somewhat interested (28%) in pursuing the M. Arch if it was offered at WPI. There is a strong demand from WPI students.
- For WPI, the integrated degree program represents a niche offering that can become a powerful tool to attract less traditional students, i.e., those that are interested in architectural design and engineering. The program thus offers an opportunity to diversify WPI's student body.
- The program aims to offer a time-effective pathway to satisfy the educational requirements to become credentialed as architects and engineers. We anticipate that this feature, combined with tuition discounts at the graduate level (for WPI alumni), will provide cost and earning benefits to graduates and provide an additional mechanism to attract underrepresented minorities interested in becoming architects and engineers.

5.2.5 Ongoing outside input from others, including practitioners.

Program Response:
Worcester Massachusetts is the second largest city in New England and is located 40 minutes from Boston. The program benefits substantially from the many architectural and engineering firms that work in the region. The program has an active industry advisory board that is composed of practitioners including architects, engineers, and contractors. Practitioners from firms in the area regularly take part in studio reviews, guest lecturers, and review of capstone projects. Most recently, the program has launched its "day in practice" initiative whereby students spend a full day at a professional firm where they get exposure to various forms of practice. The program attracts guest reviewers from architectural programs in the New England area, thus providing important touch points throughout the academic year to exchange ideas and best practices in architectural education. In return, WPI faculty also serve as guest critics at other institutions – which are mutually beneficial.

The program must also demonstrate that it regularly uses the results of self-assessments to advise and encourage changes and adjustments that promote student and faculty success.

Program Response:

In addition to course evaluation and assessment processes indicated in section 5.3, the program also conducts a number of formal and informal activities that serve self-assessment purposes and needs. These activities include bi-weekly program meetings, annual meetings with the program industry advisory board, end-of-year evaluation of student studio work, surveys of student and industry participants in the day-in-practice program, senior surveys, and course evaluations, for example. Results from formal and informal assessment activities are then used to guide changes. Some recent examples of changes based on assessment feedback are listed below:

Faculty retreat April 17, 2024
The faculty organizes a retreat once a year, and invites senior students whom participate in program discussions. A survey was conducted among students and faculty prior to the retreat to solicit feedback on a broad range of program elements, to help identify areas that need improvement and collect ideas. The survey results served as a scaffold to organize our discussions at the retreat. The outcome of our retreat resulted in several action and decisions for improving the program, which are listed below:

1. Revising the learning outcomes in design studio to satisfy the expectations of both the NAAB and ABET accreditation programs. **2**. Integrating reading, model making, and sketching assignments, communication and presentation skills, and case study analysis (Module) into all design studios in a scaffolded manner. **3**. Assigning classical architectural reading/textbooks in different studios to improve the history and theory background in the learning outcomes. **4**. All faculty and students elaborated on the benefits of Day in Practice, and the program decided to move forward with organizing this event twice in the academic year. **5**. Creating a position for a senior AREN Student (title to be determined later) to support the program for model making store and devices, managing social media, and developing a building material library. **6**. Establishing a library in Kaven Hall for building material samples. **7**. Creating a calendar for dates and times for the final presentations in design studio and advertising it to the WPI community. **8**. Organizing MQP review sessions at the end of each term for all AREN seniors and inviting all faculty to review the progress of the projects. **9**. Reviewing and revising the Studio policy and adding a section on studio expectations, which will become part of the participation and growth grade. **10**. Organizing review sessions with local architectural schools to explore collaboration, resource sharing, and best practices. **11**. Organizing the AREN lecture series before the start of the next academic year. **12**. Discussion on the master plan for the program and the possibility of an exchange program in the next academic year.

One of the discussion topics for the 2023 board meeting was on the emergence of Artificial Intelligence in architectural and engineering professions. The program was particularly interested in learning about industry viewpoints on how academia can or should respond to this emerging trend. Various breakout groups were organized to facilitate the discussion, which led to the idea of offering a new experimental course to explore AI with students in a studio setting. Such a course may also be appealing to WPI students from other majors, such as robotics or mechanical engineering. A motion for a new course was developed following the board meeting, and the motion was approved by the WPI Committee on Academic Operations, a required. The new studio course will be offered Fall 2024, the course description is included below.

AREN 400X: AI-Aided Parametric Design and Fabrication.

This course explores the integration of AI aided parametric design and digital fabrication techniques with a primary focus on architectural applications. Students will gain a deeper understanding of modeling with parameters and deciphering logical and mathematical relationships between them. Through hands-on instruction, students will learn scripting and programming principles utilizing tools such as Grasshopper and Arduino. Students will explore the creative potential of AI in the conceptual design phase, examining various tools such as Generative AI and Autodesk Generative Design while addressing ethical concerns and emerging trends in AI integration within architectural practice. The course includes a prototyping component, employing digital fabrication techniques such as laser cutting and 3D printing for rapid iteration and tactile exploration of design alternatives. Recommended background: This course is intended for students who have a basic understanding of architectural design processes and who are passionate about exploring innovative and emerging design approaches. Previous experience in architecture, design, or related design fields would be helpful. Familiarity with fundamental drafting software such as CAD and SolidWorks, as well as basic knowledge of programming concepts, would be advantageous, though optional.

Program improvements resulting from other activities:

The undergraduate BS in Architectural Engineering degree program is accredited by ABET and the program also administers various assessment instruments for this degree program. The BS AREN and M. Arch programs are highly integrated, the last accreditation cycle for the engineering program was in 2020. The assessment process resulted in several changes to our undergraduate AREN program. This section describes how the results of the evaluation processes for the Student Outcomes and any other available information have been systematically used as input in the continuous improvement of the program. There have been several changes to the program distribution requirements and courses offered. A summary of program changes follows below:

4-B-1 Changes to the Architectural Engineering Distribution Requirements

- *Increased number of major-specific required courses (2 extra courses)*
- *Expanded "Design Level" course requirement to span two areas (structures and mechanical)*
- *Expanded studio type teaching format (from 2 to 5 integrated studio experiences)*
- *Adjusted Mathematics and Basic Science requirement (from 32 to 30 semester hours equivalent - 36 semester hours supplemental science included)*
- *Expanded Mathematics and Basic Science requirement with Supplemental Science*

NAAB

Changes to the AREN distribution requirements were approved during the 2018-2019 academic year, the implementation of changes occurred at the beginning of the 2019-2020 academic year (applicable to the incoming class of 2023). The rationale for the changes is outlined below.

The AREN program has been developed according to the criteria for architectural engineering programs which requires that graduates reach the design level in one of the four topical areas, and furthermore stipulates that design should be in a context that integrates (i) other AREN areas, (ii) architectural design, (iii) advanced tools, (iv) team collaborations, and (v) attributes of building performance and sustainability. Our program was initially designed such that students take design level courses in either the building structures or building mechanical systems areas. If a student is following the mechanical track, he or she typically would not take design level courses in the other areas, and vice versa. The integration of design as outlined above then culminated in the MQP experience where students focus on either building structures or building mechanical systems.

Experience has shown that students are better equipped to reach the "integrated design" level when being exposed to design level courses in more than just one area, and when they have the ability to integrate different disciplinary areas within the context of an architectural design project. Results from our senior survey indicated, for example, that students enjoy their studio-based courses and are seeking a higher degree of content integration across the curriculum. Interactions between AREN faculty, students, and the AREN industry advisory board during annual MQP reviews has further confirmed a desire to better ground technical engineering design skills within a project based architectural design culture. Subsequently, changes were made to the AREN curriculum and distribution requirements designed to improve the design, design development, and design integration abilities of our graduates, as intended by NAAB and ABET and desired by our program. The changes to our distribution requirements are outlined below:

1. Previous distribution requirements include two architectural design studio-type courses (AREN 2002 and 3002). The new distribution requirements include five integrated architectural design studio courses. This was accomplished by restructuring the delivery format of three existing courses (AREN 3005, 3025, 3026). The proposed change emphasizes "integrated" architectural engineering design skills earlier in the program, thus better preparing students for a comprehensive capstone design experience during their MQP. The change also aimed to establish a stronger professional design culture within our program.

2. Previous distribution requirements demanded that students opt into one of the concentration tracks (i.e. structural or mechanical) during their junior year when they select 3000-level design courses in one of the tracks. The new distribution requirements have been expanded to ensure that all students take design level courses in both the structural and mechanical tracks. The intention of the change is to provide a more comprehensive architectural engineering education where graduates can truly integrate the different disciplines within the context of projects. In this fashion, the program will also become more distinctive from the civil and mechanical engineering majors.

3. To create the required space in the WPI curriculum we have integrated some of our topical areas (lighting systems, building energy simulation, building envelope design) into the architectural engineering design studio format. In this new format, the course delivery method has changed from a (primarily) lecture-based format to a mixed studio and lecture-based format. These revised courses require about 9 hours of student-faculty studio interaction per week (desk critiques), 3 hours of technical lectures per week, and about 10 hours of work outside the classroom per week.

4. In addition to the above changes, we also made changes to the mathematics and science requirement. The term "Supplemental Science" has been added to the mathematics and basic science subcategory. This will allow students more flexibility to select appropriate

foundational ES courses (i.e. thermodynamics, fluid mechanics). The mathematics probability course requirement was replaced with a course in statistics, which will better prepare students to enter emerging fields such as data science and/or graduate education. The change requires that students also take coursework in fluid mechanics, which will enhance preparedness for energy related courses, such as HVAC systems design, building physics, and building energy modeling. Fluid mechanics and thermodynamics are foundation courses for the mechanical track of our program.

The abovementioned changes prompted a revision to our distribution requirement to assure that students can complete their degree over the course of 4 years or 16 terms, while retaining sufficient flexibility in their selection of IQP's or pursuit of electives or co-op experience. The old distribution requirements amounted to 10-1/3 units (31 courses). The new distribution requirements amount to 11 units (33 courses, i.e. 2 extra courses equivalent to 2/3 units). The free electives for our program have subsequently been adjusted from 3/3 to 1/3 units to accommodate the increase in distribution requirements. The changes allow us to stay within the normal 15-unit required for a bachelor's degree at WPI (45 courses 1/3 units each, equivalent to 135 semester credit-hours). Please note that similar to the previous requirements, 1/3 unit of the distribution requirements counts towards the Humanities and Arts requirement.

Architectural Engineering is a multidisciplinary field of study that requires coursework in multiple areas of engineering science and design (structures, mechanical systems, electrical systems and lighting, and construction/project management). Architectural engineering graduates are furthermore expected to understand the basic concepts of architecture in a context of architectural design and history. We argue that these requirements are best served at WPI through an architectural engineering design education that includes architectural studio-type coursework as well as coursework in architectural history. The new distribution requirements are on a par with other multidisciplinary programs at WPI, such as environmental engineering, chemical engineering, and environmental and sustainability studies.

The revision of the curriculum was based on several assessment activities, and resulted in a revision of multiple courses, as outlined below.

Course Revision: ARCHITECTURAL DESIGN I (AREN 2002)

The revision of this course is part of our initiative to strengthen the program's integrated architectural engineering design curriculum. Previously, AREN 2002 primarily focused on the architectural design process through development of projects. The revised course now also introduces students to drawing techniques and drawing conventions, and the use of modeling software in engineering and architectural practice. This is the first studio in the new expanded studio sequence. The course retains and expands the design components; but also emphasizes providing a technical foundation through actual project-based design activities. Technical knowledge is introduced alongside the design work as an integral part of the design process. The change in focus will broaden student architectural and technical design skills, which will increase their ability to pursue a wider range of career and graduate school options. The course delivery method changed from a (primarily) studio-based format to a mixed studio and lecture-based format. The course meets during studio times on MWR from 2pm to 5:50pm. The course includes about 9 hours of student-faculty studio interaction per week (desk critiques), 3 hours of lectures per week, and about 6 hours of work outside the classroom per week. In line with WPI guidelines, the course requires at least 15-17 hours of work per week, including work outside the classroom. (WPI catalogue, page 118)

New Course: AREN 2004 ARCHITECTURAL DESIGN II - Light and Lighting

The course replacement is part of our initiative to strengthen the AREN program's architectural engineering integrated design curriculum. AREN 3005 primarily focused on the technical components of lighting system design for buildings. The new course retains the technical components of AREN 3005; but now also emphasizes developing integrative design skills through project-based activities. The new course broadens understanding of light in architecture through development of an architectural design project. Technical knowledge is introduced alongside the design work as an integral part of the design process. The course delivery method changed from a (primarily) lecture-based format (4 hours a week) to a mixed studio and lecture-based format (12 hours a week) The new course meets during studio times on MWR from 2pm to 5:50 pm. The course includes about 9 hours of student-faculty studio interaction per week (desk critiques), 4 hours of lectures per week, and about 6 hours of work outside the classroom per week. In line with WPI guidelines, the course requires at least 15-17 hours of work per week, including work outside the classroom. (WPI catalogue, page 118).

Course Revision: ARCHITECTURAL DESIGN III (AREN 3002)

The revision of this course is part of our initiative to strengthen the program's integrated architectural engineering design curriculum. AREN 3002 focuses on the architectural design process through development of projects. The revised course also introduces students to the use of advanced modeling software in engineering and architectural practice. The revised course retains and expands the design components of AREN 3002; but will also emphasize providing a technical foundation through project based design activities. Technical knowledge is introduced alongside the design work as an integral part of the design process. The course delivery method changed from a (primarily) lecture-based format (4 hours a week) to a mixed studio and lecture-based format (12 hours a week) The new course meets during studio times on MWR from 2pm to 5:50 pm. The course includes about 9 hours of student-faculty studio interaction per week (desk critiques), 4 hours of lectures per week, and about 6 hours of work outside the classroom per week. In line with WPI guidelines, the course requires at least 15-17 hours of work per week, including work outside the classroom.

New Course: AREN 3020 ARCHITECTURAL DESIGN IV - Building Energy Simulation

The course replacement is part of our initiative to strengthen the AREN program's architectural engineering integrated design curriculum. AREN 3025 focused on the technical components of building energy simulation. The revised course aims to expand understanding of sustainable design principles and energy use in buildings through integrated architectural engineering design exercises. AREN 3020 retains the technical components of AREN 3025; but now also emphasizes developing integrative design skills through project-based activities. Technical knowledge is introduced alongside the design work as an integral part of the design process. The course delivery method changed from a (primarily) lecture-based format (4 hours a week) to a mixed studio and lecture-based format (12 hours a week) The new course meets during studio times on MWR from 2pm to 5:50 pm. The course includes about 9 hours of student-faculty studio interaction per week (desk critiques), 4 hours of lectures per week, and about 6 hours of work outside the classroom per week. In line with WPI guidelines, the course requires at least 15-17 hours of work per week, including work outside the classroom.

New Course: AREN 3022 ARCHITECTURAL DESIGN V - Building Envelope Design

The course replacement is part of our initiative to strengthen the AREN program's architectural engineering integrated design curriculum. AREN 3026 currently focuses on the technical components of building envelope design. The revised course aims to expand understanding of the design development process through architectural design exercises. The course retains the technical components of AREN 3026; but now also emphasizes developing architectural design and detailing skills through actual project-based activities. Technical knowledge is introduced alongside the design work as an integral part of the design process. The course delivery method

changed from a (primarily) lecture-based format (4 hours a week) to a mixed studio and lecture-based format (12 hours a week) The new course meets during studio times on MWR from 2pm to 5:50 pm. The course includes about 9 hours of student-faculty studio interaction per week (desk critiques), 4 hours of lectures per week, and about 6 hours of work outside the classroom per week. In line with WPI guidelines, the course requires at least 15-17 hours of work per week, including work outside the classroom.

The program assessment has also resulted in non-curricular changes and initiatives aimed at improving the program, which are summarized below.

AREN Guest Lecture Series
Starting with the 2017-2018 academic year the AREN program has made a more concerted effort to organize guest lectures for its students throughout the academic year. The AREN guest lecture series are intended to expose students to different aspects of the architectural and engineering professions and often includes topics that may not be covered in the curriculum. Guest lecturers typically are architects, consulting engineers representing various specialties (structures, HVAC, fire protection, etc.), or contractors. Different from the CEAE departmental lecture series, the AREN guest lectures are deliberately directed to our architectural students. The program has drawn on its network of professional engineers and architects in the New England area and has received substantial support from the AREN advisory board members who have also volunteered. The AREN guest lecture series are typically held on Thursday afternoons from 5pm to 6pm, and typically there are about 3 guest lectures per term (12 lectures per year). This time slot has been deliberately chosen to coincide with programmed studio time and while students do not receive credit for attending guest lectures, attendance is a requirement for all studios (and some of the classes). Results indicate an increase in attendance over the years, indicating that it is becoming engrained into the educational experience of our students. While tracking of guest lecture attendance is not used for our self-evaluation process, it does provide an additional venue for students to get exposed to issues relevant to some of the student outcomes. For example, many lectures discuss the intricacies of projects and design and the associated decision-making process, which often entail discussions on ethics, professional responsibilities, and global, economic, environmental and societal contexts. The program further wants to instill in its students an aptitude to be engaged with the profession and to learn independently through non-credit bearing activities. Please note that the lecture series was interrupted by the pandemic – although we continued to offer guest lectures during this time online via zoom.

Solar Decathlon Africa 2019
The AREN program has looked for opportunities for engaging students with real world projects, and the program has provided teams to participate in two solar decathlon competitions (SD China 2013, SD Africa 2019). The AREN program at WPI was the lead university of the "Oculus Team" that competed in the Solar Decathlon Africa 2019 competition in Morocco (Figure 4-7). The Solar Decathlon is an award-winning program sponsored by the US Department of Energy that challenges collegiate teams to design, build, and showcase sustainable, net-zero solar-powered houses that are cost-effective, energy-efficient, and attractive. Team Oculus was a multi-university consortium including Worcester Polytechnic Institute, l'École Nationale Supérieure d'Arts et Métiers (ENSAM, Meknes, Morocco), l'Ecole National Supérieure d'Informatique et d'Analyse de Systèmes (ENSIAS, Rabat, Morocco), and the African University of Science and Technology (AUST, Abuja, Nigeria). Over twenty WPI-AREN and CE students and faculty and another twenty students and faculty from the partner universities participated in this project over an 24 month period working on the sustainable design, engineering, construction, planning, logistics and coordinating with its international university partners to successfully construct a solar powered house in a three week period and compete in SDA 2019. This SDA competition provided an international platform on which to promote our award winning WPI project-based programs, our global and cross-cultural strengths and accomplishments and allows students and faculty members to compete against the world's best universities in areas of global significance. The project entailed multi-disciplinary

...

collaboration among students from all partner universities. In addition to offering this as a learning experience to our students, our participation in this competition also allowed us to identify our program's strength and weakness in terms of student's readiness to take part in a "real project". The design, construction, and event planning activities were advised by professors Van Dessel and El-Korchi.
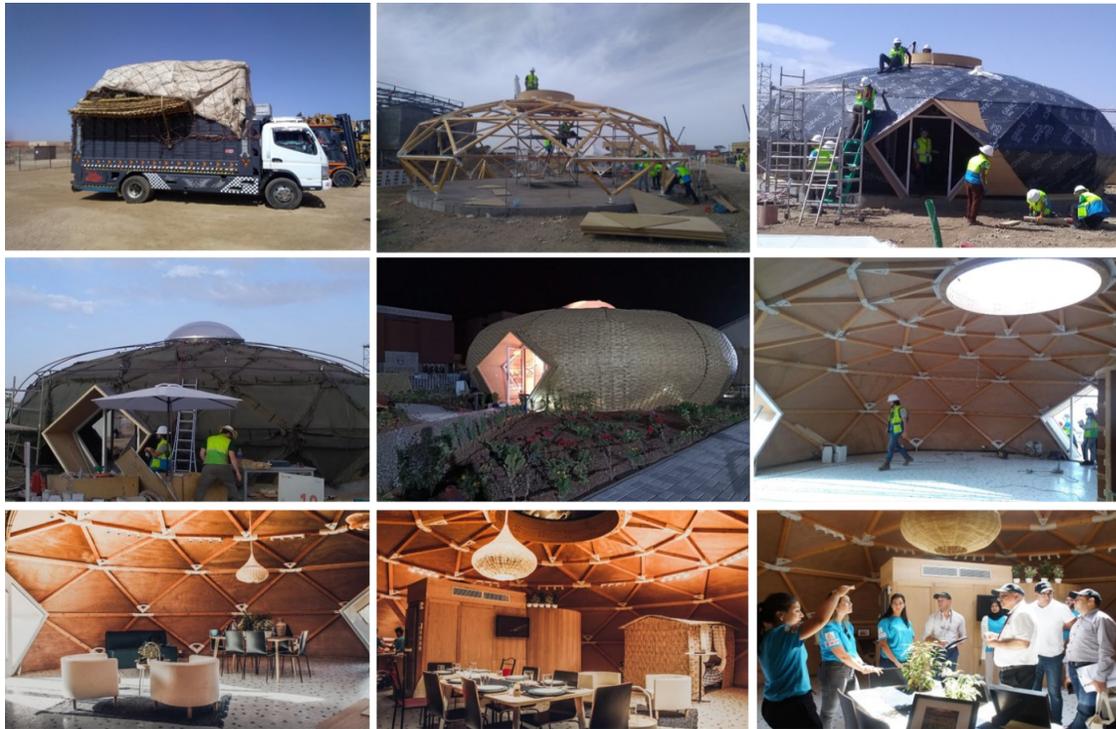

Figure. WPI Team Oculus Solar Decathlon Africa Project, Ben-Guerir Morocco 2019

Student Faculty Interactions

The AREN program is still relatively young and has grown from a hand-full of students in 2013 to about 100 students in 2024. The program has benefitted during its startup period from being very small, which had a positive impact on the interactions between students and faculty as shown in results from our senior survey during the first years of operations. As the program steadily grew in subsequent years, one senior faculty member retired and another relocated for family reasons.

Results from our surveys showed that in addition to fluctuation in survey results, there was a decline in student satisfaction in their interactions with faculty. The program has therefore looked for ways to enhance interaction between students and faculty and bring student voices into program decision-making. Starting in the 2019-2020 academic year, a more formal process was adopted to involve students with program matters. An email was sent to students by the program director asking them to step forward and serve as student representatives at program meetings. This initiative received immediate positive feedback from students and about 15 students, with representatives for each graduating class, attended a B-term 2019 program meeting. A process was discussed and decided to elect student representatives in subsequent years. Moving forward, an election was held among AREN students at the start of the academic year to select student representatives. Two students were elected from each graduating class (8 student representatives total) to serve for 1 year + 1 term. The president of the AEI student organization, which is already an elected position, will automatically serve as a student representative. Several joint meetings were held with students to discuss important program matters such as:

- Implementation of new curriculum,

- Renovation of Kaven Hall and redesign of the AREN studio spaces,
- Use and organization of studio and research space in new campus building,
- Development of a "studio policy" document,
- Advising of the AEI student chapter,
- Participation in the conferences

Established a Studio Policy

Many curriculum changes have taken effect during the 2019-2020 academic year (class of 2023). Most notably, as discussed in section above, the studio teaching model has been expanded from 2 to 5 integrated architectural engineering design studios that each meet 12 hours per week (up from 6 hours per week previously). The studio teaching format is well suited for WPI's project-based education and we anticipate that this will greatly enhance student learning through one-on-one interactions with faculty. To properly guide the implementation of this change we developed a "studio policy" document to describe the guiding principles and aspirations of a studio education, namely: to serve as a professional environment that stimulates peer to peer learning, promotes creativity in student project work, promotes healthy work habits, and creates a collegial professional environment.

Rethink the Studio Spaces (Kaven Hall)

The restructuring of the AREN studio curriculum included an increase in studio-based courses (from 2 to 5 studios), which requires a rethinking of how we use our current spaces. An architectural engineering education is an immersive project-based experience where students are engaged with significant design projects over the course of their program. Our previous studio space provided room for 21 student and had a cubicle style floorplan arrangement. We re-designed our studio space layout to be more open and to offer a dedicated studio desk space to each student in the program. This change created a much stronger sense of program community that promotes interactions among students, design professionals, and faculty within a studio environment – which resembles in many ways a professional engineering work environment. The program is housed in Kaven Hall, and the proposed studio space restructuring was implemented as part of the planned 2020 renovation of Kaven Hall (planned start date May 2020 – but the project was postponed one year because of the Covid 19 situation). As part of the renovation, the building was ADA compliant, received new restrooms, an elevator was installed, more faulty office space was created, a centralized HVAC was installed, and other changes in the arrangement of existing classrooms and computer labs were made to make them more useful for studio instruction.

The change to studio space allowed a re-arrangement of the overall space to increase capacity from 21 students (cubicle style arrangement) to about 30-40 students (open desk style arrangement). This change accommodated more dedicated desk to each sophomore and junior student in the undergraduate AREN program. The change served the restructuring of the architectural design curriculum and provided an educational home to our students upon entering the program. The removal of infill walls and a more open configuration lit by daylight also increased interactions among the students of different graduating classes.

Additional AREN Program Space in Unity Hall

A new academic building was completed in 2022. The new building houses different programs, including data science, learning science, robotics, interactive media and game design, and architectural engineering. The space allocated to architectural engineering includes 3 dedicated lab spaces for human comfort experiments and experiments on lighting; and a larger studio style space that we use for senior student capstone design studios and graduate students. The adjacency to other programs provides fertile ground for cross-disciplinary collaboration at the undergraduate and graduate levels. A makerspace with laser cutters is located in this building also.

New academic building on Boynton Street (Unity Hall) and the additional new Architectural Engineering Program research and studio spaces

5.3 Curricular Development

The program must demonstrate a well-reasoned process for assessing its curriculum and making adjustments based on the outcome of the assessment.

Programs must also identify the frequency for assessing all or part of its curriculum.

Program Response:

The curriculum of the first four years of the new Master of Architecture program is integrated with the curriculum of the existing ABET accredited Architectural Engineering program, the program is already collecting assessment data for engineering student learning outcomes (SLO) for many courses. This process, which uses an assessment cycle as shown in the figure below, results in the gathering of quantitative and qualitative data that is used for program self-improvement. After students are admitted to the 5th year of the program, the program will start collecting SLO data for all courses and other program elements and this will be added to the annual assessment cycle. This effort will include gathering direct and indirect data on the achievement of the NAAB program and student criteria.

For courses, each faculty member indicates what specific program and student criteria are included and relevant to their courses, and to what extent. This course information is mapped for the entire curriculum, alongside non-curricular program components, and this information collectively provides a useful overview of the coverage of criteria within the program overall. The program will use several instruments to collect data on the achievement of Student Learning Outcomes (SLOs). Much of this evidence is based on outcomes of coursework, MQPs, and IQPs, which in turn constitute degree requirements. To ensure that every student meets the Student Outcomes and to determine the level of student achievement, the Program will employ a number of data collection tools, including:

- Degree evaluations,
- Faculty Course Assessments,
- Student Course Evaluations,

- Faculty MQP Assessments,
- Biennial IQP Review,
- Senior Survey,
- Alumni Survey,
- EBI Survey,
- Post-graduation statistics.

In order to specifically address *connections* between tools and evidence, an overview of the assessment tools as they are related to Student Learning Outcomes will be developed in the 2024-2025 academic year. Briefly, this tool will list the sources of evidence such as courses, surveys and other tools that are used in different ways and with different emphasis to help us understand the extent to which we are achieving a specific Student Learning Outcome. The relationship between an assessment method and outcome is indicated as being either a direct or indirect indication. A "direct indication" means that an aspect of the instrument was specifically designed to assess a Student Outcome as its primary purpose. An "indirect indication" means that the design of the assessment instrument was not under program control or was not primarily intended to assess outcomes.

5.3.1 The relationship between course assessment and curricular development, including NAAB program and student criteria.

Program Response:
Our approach to assessment of what we deem desirable skills and abilities (with the context of our Student Outcomes) is to provide mechanisms for determining student performance throughout their academic program, to report the findings in a timely and constructive way, to determine and obtain relevant comparisons for the data received, and to provide anonymity to students as they fill out survey tools. These mechanisms, in turn, provide ways to collect evidence of those skills and abilities. Finally, the evidence is used in a circular manner, once reviewed, to modify how we implement our program to foster those skills and abilities. Through this approach, we aim to have high confidence that our students are meeting Student Outcomes, and also have confidence in the data collection process. The figure below provides a graphical overview of the program assessment and continuous improvement process.
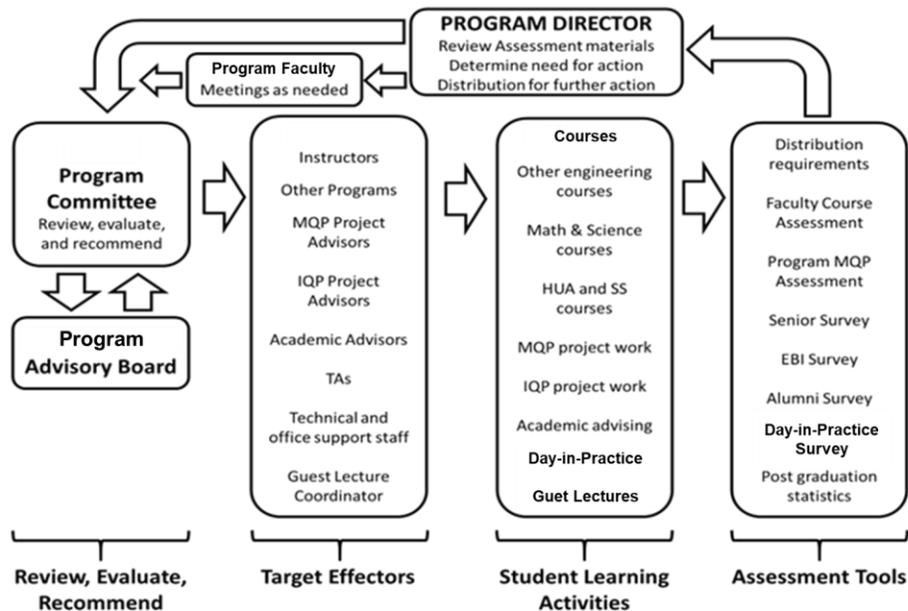
Program Assessment and Continuous Improvement Process

The following steps are in place for developing the assessment plan:

1. Identify goals and objectives,
2. Identify desirable outcomes,
3. Determine evidence needed to verify outcomes (including specifying specify assessment methods to obtain evidence and developing connections between evidence and assessment),
4. Determine feedback channels to provide for continuous improvement,
5. Conduct assessments,
6. Evaluate assessment results, determine opportunities and take appropriate action.

Each of these steps is discussed in further detail below.

Step 1: Identify Goals and Objectives
Step 2: Identify Outcomes
Step 3: Determine Evidence, Assessment Methods, and Connections
Much of our evidence is based on outcomes of coursework, MQPs, and IQPs, which in turn constitute degree requirements. To ensure that every student meets the required Student Outcomes and to determine the level of student achievement, the Program employs a number of data collection tools. These tools include:

- Degree evaluations;
- Faculty Course Assessments (updated in 2018);
- Student Course Evaluations;
- Faculty MQP Assessments;
- Biennial IQP Review;
- Senior Survey (updated in 2018);
- Alumni Survey (updated in 2018);
- EBI Survey;
- Post-graduation statistics;

Step 4: Determine Feedback Channels
Oversight of the assessment reporting is provided by the Director of the program, who reviews the collected assessment material and then, as necessary, discusses the evidence with the faculty as a whole to establish a plan for action.

Step 5: Conduct Assessments
Step 6: Evaluate Results

Each of the assessment instruments is described in more detail below.

Tool 1: Degree Evaluation: The degree evaluation is used to verify that students have met all WPI and program requirements at the time of graduation. The degree evaluation is a listing of all requirements and how a student has (or has not) met each requirement through completion of specific courses and project work. The degree evaluation of all students is reviewed by the program director in the fall of the graduating year with notes on what portions of the curriculum need to be completed for a student to meet graduation requirements. The evaluation is again reviewed by the registrar prior to graduation. Reviewing degree evaluations ensures that students meet all requirements for graduation, thus supporting all program Student Outcomes.

Tool 2: Faculty Course Assessment: A significant number of the Student Outcomes are met by successfully completing specific courses for which the attainment of a student outcome needs to be demonstrated in order to pass the course. For each course that may be used to satisfy program requirements, the faculty member responsible for the course content and syllabus

completes a *Course Outcomes Data* form that provides quantitative data on how the course meets Student Outcomes. The prevalence of each outcome in the course <u>content is rated on a scale of 0 to 4</u>. It is intended that these data be used in course assessment, and in evaluation of the curriculum as a whole.

The *Course Outcomes Data Sheet* is helpful in several ways. First, the faculty member teaching the course is expected to design the syllabus and grading policy to ensure that each student that passes the course will demonstrate their competence in the Student Outcomes that are rated 3 or 4. Second, data from all courses used to fulfill components of the program provides an overview of how each Student Outcome can be met by students. A review of these data identifies both the outcomes that are met in several ways as well as the outcomes that are met minimally. In the latter case, the Program Committee can use this information to enhance the curriculum to provide more experiences for students to meet specific Student Outcomes if any Outcomes are not adequately addressed in the curriculum. Course content can be revised as necessary, such that specific Outcomes are included in individual courses to a greater or lesser degree, and courses may be added/dropped over time as the curriculum develops with the needs of the students and the profession over time. In summary, the Faculty Course Assessment supports all Student Outcomes as faculty are directly indicating which outcomes are included in a course, and to what level they are included.

<u>Tool 3: Student Course Evaluations:</u> Course evaluations are completed by students at the end of each course. The evaluation includes a series of questions on the quality of the course, the quality of the teaching, and the educational experience. Faculty also have the option to include course specific questions, and this feature of the course evaluation can be used to gather assessment data on student's own perspective on meeting student outcomes. Results are compiled as the percentage of responses in five categories from Strongly Disagree to Strongly Agree. In addition to feedback on the perceived quality of their professor's teaching, students also self-report time on task, the amount of material learned, and the grade they expect to receive. The quantitative data for courses may be compared to courses from other WPI departments or the university as a whole in the same academic year.

<u>Tool 4: Faculty MQP Assessment:</u> As defined by the university, the "qualifying project in the major field of study should demonstrate application of the skills, methods, and knowledge of the discipline to the solution of a problem that would be representative of the type to be encountered in one's career." MQP activities may encompass research, development, or application. They may involve analysis or synthesis, and can be experimental, theoretical or a combination of both. MQPs may emphasize a particular sub-area or combine several sub-areas or disciplines. In virtually all cases, MQPs involve a capstone design activity. Students select an MQP to meet their personal goals and their programs' educational objectives.

Upon completion of the MQP, the faculty advisor(s) completes an MQP Evaluation Form. This form records some project details as well as the faculty advisor's designation that the MQP demonstrates capstone design experience. In Section II of the form, the advisor records their assessment of the level of accomplishment in the Student Outcomes that the students demonstrated in the MQP on a scale of 1 – 4. The form includes the outcomes directly, and thus results from this assessment instrument can support the majority of Student Outcomes.

In addition to the project process and a final project report, students are also required to present their project on Project-Presentation-Day at WPI, a day in which MQP students present their senior design projects to an audience of faculty, peers, project sponsors and other interested parties. The judges view all posters over a 2 to 3-hour period; and select finalist groups. These groups are then required to do a 3-minute oral presentation of their project, followed by a question-and-answer session. A single winning team is selected for the CEAE Advisory Board Award each year. This forum provides a means for outside CEAE advisory board members and alumni to evaluate the projects and provide the program with verbal feedback on the quality of work conducted by students each year.

Tool 5: IQP Biennial Review: The Interdisciplinary and Global Studies Division (IGSD) has supervised the summer assessment of Interdisciplinary Qualifying Projects (IQP) every few years for over two decades. Initially, the assessment focused only on the quality of completed projects as revealed by the reports. In the late 1990s, the assessment was expanded to gather information that might also serve as a measure of progress in achieving learning outcomes. In 2007, the WPI Faculty approved a set of IQP specific learning outcomes, and therefore the most recent IQP assessment measures both project quality and progress on this array of learning outcomes. IGSD designed the summer 2013 IQP study to gather information on project quality and to measure progress on this array of learning outcomes. As an interdisciplinary academic requirement, unrelated to a student's major, the IQP was not designed to address the learning outcomes that are at the core of accreditation processes. The regular review of students' performance on IQP learning outcomes does however provide information *relevant* to several NAAB Program and Student criteria.

Tool 6: Senior Survey: A senior survey has been implemented on an annual basis starting with the first AREN graduate in May 2014. As is done in many other departments on campus, the survey is typically distributed on Project Presentation Day, which results in a rate of return generally nearly 100%. The survey provides data on how the WPI education helped students gain skills and abilities that are stated in the Student Outcomes, and thus provides data on all the outcomes in the program.

Tool 7: Alumni Survey: An alumni survey was developed based on surveys used in other departments at WPI. The alumni survey was first implemented in the Spring of 2015. The alumni survey was implemented for a second time in Spring 2020 at which time there were 66 (AREN) alumni, and 66 with known email addresses. The alumni survey was developed with questions that are directly related to ABET Program Educational Objectives, and will be expanded to also collect data on NAAB program and student criteria.

Tool 8: EBI Survey: WPI has participated in the EBI exit survey (from Educational Benchmark, Inc.) since 2000. The EBI Survey is a commercial survey developed by Educational Benchmarking Incorporated; and is used widely by accredited institutions. The participating schools represent a broad range of size, reputation, and mission.

Departments and programs ask graduating seniors to fill in and return paper survey forms at the end of D term, and often use an incentive such as attendance at a reception or dinner to promote responses. In 2019, surveys were received from 403 students in engineering programs at WPI. All questions were answered on a seven-point scale, with three types of possible responses:
- "extremely dissatisfied" (1) to "extremely satisfied" (7);
- "extreme disagreement" (1) to "extreme agreement" (7); and
- "none" (1) to "very great amount" (7).

The extensive EBI response data are grouped into 15 factors. These data are then used to determine levels of satisfaction among WPI graduates on each question, and to compare WPI responses to peers at similar institutions. While the EBI survey is designed specifically to capture student responses useful in preparing self-studies, it also provides much that is useful for WPI beyond accreditation.

Tool 9: Post Graduation Statistics: The market for our graduates is an important indicator of the quality of our program and the educational outcomes obtained by our students. The Career Development Center (CDC) surveys and/or researches each of the students in WPI's annual graduating classes. If students have not reported to the CDC, then the office reaches out to faculty, staff, and employers for their information. The remaining pool is then researched using LinkedIn and Facebook to determine what information is shared publicly. For each graduating class, the data are gathered between August of the graduating year and May of the following year.

Frequency of Assessment Tool Use
As noted at the beginning of this section, Step 5 entails conducting the assessments.
The table below shows the program assessment tools and their frequency of use.

Program Assessment Tools, Frequency of Use, and Performance Criteria

ASSESSMENT TOOL		PERFORMED WHEN	PERFORMED HOW	PERFORMANCE CRITERIA
#	DESCRIPTION			
1	Degree Evaluations	Two terms prior to graduating	Reviewed by Program Director	Meet all WPI and program requirements
		Immediately before graduating	Reviewed by Registrar	Meet all WPI and program requirements
2	Faculty course assessment	Annually	Faculty review inclusion of student outcomes in each course	Inclusion of at least 2 Program course options with extent of 3 or 4 for each outcome
3	Student Course Evaluations	At end of every course	Reviewed by appropriate Department Heads	No less than 1 standard deviation below mean; action by Department Heads / Program Director
		Annually	Director reviews aggregate data	
4	Program MQP assessment	At the end of every project	Faculty complete assessment form	Level of achievement: 3 out of 5
		Every 3 years	Program Director reviews aggregate data	
5	Biennial IQP Review [IGSD]	Biennially	Tabulated performance data reviewed by IGSD; campus-wide action if deficiencies noted	Level of achievement on specific outcomes; campus-wide action
6	Senior Survey	Annually on Project Presentation Day (April)	Program Director reviews aggregate data	Mean responses: 3 out of 5
7	Alumni Survey	Once every six years	Program Director reviews aggregate data	Mean responses: 3 out of 5
8	EBI Survey	Annually on Project Presentation Day (April)	Tabulated EBI data provided by WPI	Comparison to other institutions
9	Post-Graduation Statistics	Annually	Compiled by CDC	Adequate post-graduation placement

Expected Level of Attainment for each Student Outcome

As noted at the beginning of this section, Step 6 entails evaluating the results of the assessment tools and taking action if needed. The program has agreed to the following metric:

<u>For meeting a specific Student Outcome, students should complete:</u>

- one Engineering Science and Design course with a rating of 3-4*, or
- MQP with a rating of 3-4**, or
- two Engineering Science and Design courses with a rating of 1-2*, or
- one degree requirement with a rating of "high" (e.g., IQP).

In summary, each program outcome is met through various courses in the program requirements (including the MQP), and additional WPI requirements such as HUA, SS and IQP. These metrics can be directly measured by:

- Degree evaluations (which attests that a student successfully completed courses or projects that require attainment of specific student outcomes in order to pass the course)
- Faculty course assessments (which attest that individual courses include outcomes)
- MQP assessments (which attest that individual projects include outcomes)

In addition, the remaining assessment tools provide a mix of direct and indirect evidence from faculty, students and alumni that the cumulative curriculum has provided education and knowledge to meet each of the Student Outcomes and that the program is high quality. These direct and indirect measures include:

- IQP reviews
- Senior survey
- Alumni survey
- EBI survey
- Post-graduation data

On these tools, the program reviews all results and considers whether action is necessary if data demonstrate any aspects of courses, projects or the curriculum are below acceptable values.

<u>Faculty Course Assessment</u> ratings of inclusion of outcomes <u>on a scale of **0 to 4**</u> as follows: **0** = not at all, **1** = briefly discussed in class or assigned related reading but did not require student work related to this topic, **2** = topic was included in one or more homework assignments or projects but did not appear on tests and was not a key component of any major assignments, **3** = topic was included on at least one test or was a key component of some other major assignment, **4** = topic was included and tested to such an extent that a student could not pass this course without considerable knowledge of this topic.

<u>Capstone Design Project (Major Qualifying Project)</u> Faculty rate extent of inclusion of each student outcome and the level of team accomplishment on that outcome. Ratings of inclusion of outcomes are <u>on a scale of **0 to 4**</u> as follows: 0: Not at all, 1: Very little, 2: Somewhat, 3: Quite a bit, 4: Extensively. Ratings of inclusion of level of accomplishment are also <u>on a scale of **0 to 4**</u> as follows: 0: Inadequate, 1: Marginal, 2: Adequate, 3: Good, 4: Excellent

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5.3.2 The roles and responsibilities of the personnel and committees involved in setting curricular agendas and initiatives, including the curriculum committee, program coordinators, and department chairs or directors.

Program Response:
The faculty members of the program are collectively responsible for the development of the curriculum to support the degrees awarded within the program. This responsibility includes:

- Develop course content that supports attainment of SLOs, utilizing faculty strengths and areas of specialization.
- Evaluation of attainment of SLOs,
- Scheduling of courses within the sequence,
- Setting contact hours required to deliver course content.

The Program Director collaborates with faculty from the Program and Department to coordinate and steer the development of the curriculum. New curriculum developments, or significant changes, are voted upon by program faculty, after which motions are developed for review by the Committee on Academic operations (CAO) or the Committee on Graduate Education & Research (CGSR) for changes at the undergraduate and graduate level respectively. The final authority for approving changes, or for developing new courses, lies with the WPI faculty, based upon recommendations made by the CAO and CGSR committees. This process was followed for the development of all existing and new courses of the program, as per institute regulations.

5.4 Human Resources and Human Resource Development
The program must demonstrate that it has appropriate and adequately funded human resources to support student learning and achievement. Human resources include full- and part-time instructional faculty, administrative leadership, and technical, administrative, and other support staff. The program must:

5.4.1 Demonstrate that it balances the workloads of all faculty in a way that promotes student and faculty achievement.

Program Response:
Worcester Polytechnic Institute is a research university that excels in combining teaching and research. In 2016, The Wall Street Journal/Times Higher Education College Ranking ranked WPI first in the nation for the category of " Top Faculties; Schools that do the Best in Combining Scholarly Research with Classroom Instruction."

Research active faculty typically teaches 9 course credits per academic year. Most undergraduate courses, including studios, carry 3 credit hours. In addition to teaching courses, most faculty also advise undergraduate projects such as the GPS, IQP or MQP courses, which carry the equivalent of 6 to 9 course credits per student. Most faculty advise 2 or 3 projects annually, with each project involving 3 to 4 students on average. In addition to teaching and research, faculty also serve their community in various ways, such as assuming committee duties and participating in faculty governance.

The master program is integrated with the existing architectural engineering program, which has a student population of about 100 with an incoming class size of around 25 students in recent years. The small class size and studio teaching model results in a close working relationship between individual students and faculty. Faculty members are easily accessible outside of scheduled class time, student academic advising is shared among all full-time faculty affiliated with the program.

Sabbatical leaves may be taken for a full academic year or a half academic year. All full-time tenured and tenure-track faculty are eligible to apply for a full-year or half-year sabbatical leave

after 6 years of full-time service since their most recent hiring at WPI or since their previous sabbatical. A full year sabbatical leave is taken at one-half of the faculty member's academic year salary. Half-year leaves are taken at full salary. The major purpose of leaves is to provide opportunity for continued professional growth and new, or renewed, intellectual achievement through study, research, and writing.

5.4.2 Demonstrate that it has an Architect Licensing Advisor who is actively performing the duties defined in the NCARB position description. These duties include attending the biannual NCARB Licensing Advisor Summit and/or other training opportunities to stay up-to-date on the requirements for licensure and ensure that students have resources to make informed decisions on their path to licensure.

Program Response:
Peter A. Caruso, AIA, serves as the NCARB Architecture Licensing Advisor (ALA) for our students, as defined in the NCARB position description. The role includes attending the NCARB biannual Licensing Advisor Summit and/or other training opportunities to stay up to date.

5.4.3 Demonstrate that faculty and staff have opportunities to pursue professional development that contributes to program improvement

Program Response:
The mission of the Morgan Teaching and Learning Center is to advance teaching and the professional growth of faculty at WPI. Teaching in WPI's innovative project-based curriculum - and within our distinctive calendar and balance between teaching and research - is deeply rewarding, challenging, and motivating, through all stages of a faculty career. The Morgan Teaching and Learning Center maintains and strengthens instructional effectiveness, student learning, and faculty learning by offering evidence-based training and development programs, services, and resources for faculty, staff educators, and for student teaching assistants. The Center also catalyzes innovation in the curriculum and in teaching practice and brings together campus-wide communities for reflection, dialogue, and action on teaching and student learning.

The Center's main objectives are to:
- build the teaching knowledge and skills of all instructors in order to promote continual individual growth in teaching effectiveness and enhancement of student learning;
- support teaching and learning innovations in areas aligned with WPI's goals;
- continue developing a culture of student learning assessment to guide improvements in teaching practice and curricular change; and
- recognize teaching achievements.

The Morgan Center also coordinates campus-wide mentorship and faculty development programming for new faculty and for faculty at the Associate rank. Throughout its work, the Center aims to advance WPI's mission and live its values of community, inclusion, respect, innovation, and achievement.

In a national survey of faculty job satisfaction that WPI participates in regularly, mentoring has consistently been a strength at WPI. This may be because so many people are committed to mutual mentoring and collaboration -within departments and also across departments. The Morgan Center focuses on cross-departmental mentorship programs for different career stages. The center also serves as the liaison for WPI's institutional membership in the National Center for Faculty Development and Diversity (NCFDD).

WPI is an institutional member of the National Center for Faculty Development & Diversity (NCFDD), an independent professional development, training, and mentoring community focused on helping individuals make successful transitions throughout their careers. Resources and benefits of the membership include a wide variety of webinars and courses on topics

ranging from summer or semester planning and scholarship and grant writing to teaching, productivity, and work-life balance, and are available to all WPI faculty, postdocs, and graduate students at no cost.

In Fall 2023, WPI also launched its inaugural Women's Leadership Program (WLP), an in-person, seven-session program funded by the Women's Impact Network (WIN). This is an inclusive program with a focus on women and people who are gender diverse, open to all regardless of gender identity. The program's customized professional development curriculum is designed to provide:

- Insights and tools necessary to deepen knowledge, skills, and abilities in evolving leaders;
- Valuable networking opportunities through course participation and post-program convenings; and,
- A supportive community to work with and uplift one another.

The program and CEAE Department also enable opportunities for faculty to engage in lifelong learning. This includes funding to travel to conferences or participate in workshops, which are in part paid from a modest endowment and donor funds created to support travel, conferences, and short courses. Students also have an opportunity to request funding from the WPI Student Government Association, which in the past has provided funding for attending the annual AEI conference.

5.4.4 Describe the support services available to students in the program, including but not limited to academic and personal advising, mental well-being, career guidance, internship, and job placement.

Program Response:
Worcester Polytechnic Institute provides a wide range of student support services that are available to students in the program through the Division of Student Affairs. Their mission is guided by the core values of advocacy, citizenship, empowerment, inclusion, respect, and support. Student services staff across the university focus on creating and leveraging partnerships with students, parents, faculty, and staff, all of which are designed to enhance the comprehensive student experience. As such, staff have appropriate credentials (Bachelor's/Master's/PhD/EdD) and experience in their functional areas. Over the last decade, as its student population has grown, WPI has invested in staffing as warranted to meet direct student needs. Areas where staff counts have grown include Physical Education and Athletics, Student Activities, Health Services, Counseling, Career Development, Academic Advising, Accessibility Services, and Multicultural Affairs.

Staff roles (permanent and contract) continue to be added when data or workload situations warrant. Between 2015 and 2020, the work of Student Affairs was guided by a division-wide strategic plan that emphasized six priorities: health and safety, increases in diversity education and programming, more welcoming environments for students of diverse backgrounds, increases in student resilience, student reflection, and an enhanced graduate student experience. Each department set goals annually in relation to these priorities and reported on success through an annual end-of-year report.

Orientation Programs
WPI offers a comprehensive four-day New Student Orientation (NSO) program for undergraduates and transfer students. NSO is followed by the Insight program in which a faculty member, an upper-class student leader, and a residential advisor partner to support a group of 25 or so first-semester students. Graduate students have a less formalized orientation program, one that focuses on integration with student support services and each student's

academic department. Orientation programs for both levels of students focus extensively on academic success services and other campus services that support student integration and satisfaction with their college experience.

Academic Advising and Accessibility
Over the past 10 years, the university has worked to build more robust student support services, including academic support and advising services. These services are integrated with Student Affairs through bi-weekly Academic and Student Affairs Partnership (ASAP) meetings, which discuss cross-divisional concerns affecting both Academic Affairs and Student Affairs.

Each undergraduate student is assigned a professional academic advisor in the Office of Academic Advising and a faculty advisor in their major. Faculty advisors assist students with course selection, academic planning, developing research and career interests, and graduate school preparation. Staff advisors serve as generalists in supporting students with course selection, identifying and choosing a major, transition to college, academic planning, and coaching. The university offers many academic support services that are extensively used and designed to directly support academic success. These include MASH (Math and Science Help), academic tutoring, and academic coaching. Over the past decade, the department has added four new positions, for a total of eight full-time professional staff.

Online and corporate education graduate students are each assigned a student success manager who serves as their primary contact to help them navigate WPI. The success managers assist online graduate learners with understanding registration and fees, financial aid applications, plans of study, and applying for graduation. In-person, online, and corporate education graduate students also work with an assigned faculty advisor.

The Office of Accessibility Services (OAS) helps students receive support that enhances their academic success and social experiences. Staff review documentation, implement appropriate and reasonable accommodations, and help students develop self-advocacy skills and build strategies for success regarding time-management and organizational skills. Also important, OAS collaborates with faculty and staff to promote awareness and provide guidance on accommodation-related matters. OAS has experienced significant student usage over the past five years, with the number of students registering with the office growing by 29%, proctored exams by 28%, parent inquiries by 26%, and requests for note takers due to student injury by 60%. In response to this growth, the department has added a Test Proctoring Manager and an Assistant Director.

As part of a multi-part grant from the Davis Foundation, WPI in 2019 created the SWEET (Supporting WPI through Effective and Equitable Teamwork) Center to directly support students as they endeavor to have effective team experiences and develop the skills needed to collaborate effectively in teams throughout their careers. This center has provided valuable support for students as they navigate the challenges of team dynamics and working together within WPI's project-based curriculum.

Residential and Dining Services
Residential Services annually houses approximately 2,300 students in 12 residential locations, though this number has increased in 2021-22 in order to house a large first-year class and because not all spaces have been re-densified following the pandemic. The staff also focuses on student growth through community building and social opportunities. The Resident Advisors (RAs) and the professional Community Directors (CDs) build self-advocacy and resiliency through one-on-one conversations and educationally focused conduct meetings. These interactions center on students' well-being and success, direct them to resources, and provide them opportunities to be heard. As WPI's student residential population has grown, the number of live-in professional CDs has increased only slightly. As a result, each CD is responsible for several residence halls and about 800 students, on average. While this ratio makes us lean,

WPI is fortunate to have an excellent student RA staff who serve as the frontline support for students; each RA overseas approximately 60 students. Typical occupancy rate is approximately 96%.

WPI's student population growth has been coordinated with the addition of two residence halls (Faraday Hall in 2013 and Messenger Hall in 2018). As the undergraduate population has increased by 35% over the last 10 years, on-campus housing has grown by approximately the same amount. As a result, the undergraduate student population living in WPI-owned and fraternity and sorority-owned housing has remained relatively constant at 62%. As the student population continues to grow, WPI will need to enhance the residential housing infrastructure to support the undergraduate and graduate student on-campus living experience. WPI's graduate housing choices continues to be an issue of capacity, as WPI is limited in the number of properties that meet graduate students' price point.

Dining Services provides numerous dining options for WPI community members in Morgan Commons, the Campus Center, the Innovation Studio Café, the Library Cafe, the Goat's Head, the Innovation Kitchen, and Dunkin Donuts. These include options that support WPI's international students, vegan and vegetarian diners, those with allergies, and students seeking halal options. Residential students choose from a variety of meal plans, and students in spaces that do not require a meal plan often purchase a voluntary meal plan. Altogether, approximately 2,800 students purchase meal plans. Students may also meet with a dietician who can help them navigate their dietary needs through nutritional consultation. As part of a five-year dining renovation plan, WPI is investing in numerous facility and technological improvements.

Multicultural Affairs
The Office of Multicultural Affairs (OMA) serves as a home base for women-identified students, underrepresented minority students, students of all faith traditions, and members of the LGBTQIAP+ community. Signature programs include Connections, which helps acclimate approximately 60 students annually from traditionally underrepresented backgrounds to campus and academic life; the Louis Stokes Alliance for Minority Participation (LSAMP) scholars program, which prepares about 30 underrepresented students in the STEM field for graduate school; and the Great Minds/CoMPASS (GMC) scholars program, which focuses on Pell-eligible first-generation students from the Worcester public school system. The OASIS house and Collegiate Religious Center provide spaces for OMA-supported programs. To best support these growing populations, WPI has invested in two additional full-time staff roles since 2012 and added faculty fellows who receive a stipend to mentor and support students.

OMA closely tracks the retention of women and underrepresented groups, which has held steady or increased over the last decade. The retention rate for women students has been about 96% over the last decade, even as the first-year women student population has grown from 304 (2009) to 480 (2019). The retention rate for traditionally underrepresented student rose from 92% in 2009 to 98% in 2019. WPI has tracked first-generation students since the fall of 2016; their retention rate has risen from 91% to 98%. Graduation rates (six-year) for women and underrepresented students are 92% and 80%, respectively.

In 2017, WPI received a three-year grant from the Davis Educational Foundation to help students identify and address bias and engage in group work in ways that promote equity, skills that will prepare them for an increasingly diverse workforce. The grant work is designed to help students flourish in STEM organizations, where women and students of color are often underrepresented and where traditional stereotypes may still exist. This is the same grant that supported the aforementioned SWEET Center.

International Student Life
The Office of International Student Life provides on-going programs and essential services to support international students in their transition to U.S. society and academic culture. To help

ensure student and institutional compliance with federal regulations, the office advises students on immigration and employment issues, while promoting their academic and professional growth. Dependent on the world or economic situation, the international student population has fluctuated over the past few years. Like many institutions, WPI is currently experiencing a decrease in both undergraduate and graduate international student enrollment. Over the past five years, undergraduate enrollment has ranged from 491 in 2015 to 392 in 2019; graduate enrollment has ranged from 819 in 2015 to 767 in 2019. WPI views this as cyclic and anticipate these numbers will stabilize upward over the next decade. Due to the increase in federal regulations and expectations for monitoring and tracking WPI students on campus and while on practical training, another full-time International Student Advisor joined the staff.

Student Health, Wellness, and Counseling
The CARE Team meets weekly to assist students who are exhibiting distressed or disruptive behaviors and to develop action/ outreach plans to assist these students. The number of students on the CARE Team's radar has increased by 45% over the past five years. The teams' portfolio is expected to continue to increase as referrals arrive from faculty, staff, fellow students, parents, and friends through phone calls or the "I'm Concerned about a Student" portal.

Student usage of the services of the Student Development and Counseling Center has increased by at least 25% over the past five years. While many campuses struggle to meet student mental health needs, the SDCC has been able to meet the increasing demand for clinical services through day-of appointments, triage sessions, and hiring of contract staff. The Student Support Network Training program is a core support system established as a best practice and shared with and adopted by campuses throughout the United States. Other programs coordinated by the SDCC include virtual pre-orientation training for all students, encompassing alcohol and drug education, bystander intervention training, and Title IX and sexual assault intervention training. For support and adjudication surrounding sexual misconduct incidents, the university hired its first dedicated Title IX staff member in 2017. This staff member is responsible for all educational, prevention, and intervention efforts. To understand students' needs, the SDCC conducts the Healthy Minds Study (administered most recently in spring 2021) to monitor and benchmark the overall well-being of the student body. Overall student wellness remains an important priority, as articulated in the 2021 Strategic Plan.

Through telehealth appointments and daily in-person care at two on-campus clinic sites, the Health Services Team provides students with accessible, cost-effective, and quality healthcare for a wide range of medical issues. Health Services appointments have varied over the past five academic years, from 4,493 appointments in 2017 to 3,659 appointments in 2020. Most of these patients are seen by Nurse Practitioners (75%), followed by Registered Nurses or Licensed Practical Nurses (13%), and a Medical Doctor (12%). When experiencing high patient volume, WPI employs supplementary contract staff.

As a response to the COVID-19 pandemic, Health Services set up two distinct physical clinics: a respiratory clinic to see ill students and the well clinic to see non-COVID-19-related health concerns. Two new clinical staff members were hired to manage the increased case load of COVID-19 needs and provide weekend coverage and daily check-ins for students in isolation. Additionally, WPI created a public health team, with three new staff members, to manage faculty, staff, and student testing, positive cases, contact tracing, and isolation and quarantine operations.

Student Activities/Leadership Programs/Community Service/Fraternity and Sorority Life
The Student Activities Office (SAO) supports more than 230 student organizations on campus, including a vibrant fraternity and sorority community that comprises approximately 31% of the student population. Staff provide a wide range of campuswide programs and resources,

including an extensive leadership development series featuring sequenced programs, luncheons, and lectures, and a broad community service program that generates approximately 31,000 hours of service to the Worcester community. SAO is instrumental in planning and leading Family Weekend, the Homecoming Cup Competition, New Student Orientation, and a trips program throughout the local (Massachusetts) area.

WPI offers a dynamic breath of organizations, all funded through the Undergraduate and Graduate Student Government Associations. Approximately 61% of all students (undergraduate and graduate) are involved in one or more student organizations. Some of WPI's newest organizations include academic focused groups (American Statistical Association, Optical Society of America, Women in Cyber Security); general interest groups (International Game Developers Association, Lego Club, Special Olympics College Club, First Gen Student Association); and sports-focused groups (Campus Recreation Advisory Council, Men's/ Women's Club Basketball).

The presidents of the Undergraduate Student Government (SGA) and Graduate Student Government (GSG) meet and report to the Board of Trustees several times per year and are actively involved in institutional decision making through involvement on most university committees.

Career Development Center
The Career Development Center (CDC) offers extensive career services to undergraduate students, graduate students, and alumni to help them identify and achieve their career goals. This is one of the reasons The Princeton Review in 2019 ranked the office No. 5 nationally for "Best Career Services." To help students secure full- and part-time employment, summer internship, and co-op positions, the CDC works closely with employers, over 400 of whom recruit on campus each year. Students also receive direct assistance with choosing a major, exploring career options, resume writing, and interview preparation. Services include an on-line search and recruiting platform (Handshake), course offerings like Discovering Majors and Careers, individual career advising, educational workshops, and career fairs. Alumni are encouraged to use CDC services as they navigate their career; accordingly, the CDC has intentionally realigned and grown to nine full-time staff members. Data from 2020 demonstrates that 90% of WPI bachelor's degree recipients enter employment, graduate school, or the military within six months of graduation, earning average salaries of $72,072. Master's degree recipients ($84,957 average salary) and PhD recipients ($101,769 average salary) also have excellent results.

Physical Education, Recreation, and Athletics
The Physical Education, Recreation, and Athletic (PERA) Department supports academic and co-curricular life through undergraduate student involvement in required physical education (PE) courses, as well as recreational activities and varsity athletics. Students may choose from over 40 PE courses and over 50 recreational activities to explore wellness and sport. These opportunities include club sports (which have grown from 30 to 42 sports programs during the past decade and now involve more than 2,000 student participants) and intramural sports (with more than 1,400 student participants).

The highly successful WPI varsity athletics program competes at the NCAA Division III level, where the focus is on the studentathlete who succeeds in competition and in the classroom and the community. Demonstrating WPI's commitment to academics, varsity student-athletes graduate at a higher rate than the general student population while maintaining higher overall academic performance.

Student Aid and Financial Literacy
Affordability is an important part of WPI's institutional recruitment and retention strategy. The Office of Student Aid and Financial Literacy (OSA&FL) facilitates the student-centered

awarding of approximately $21 million in federal and institutional loans and approximately $104 million in institutional grant dollars. Federal Work Study is also a part of student aid packages, in the amount of approximately $335,000. These dollars have helped WPI manage the amount of debt our graduates have upon their departure, which is an important focus of the 2021-2026 strategic plan. For the class entering in fall 2019, the OSA&FL redesigned the financial aid award for clarity. The award letter now provides additional relevant information on retention and return on investment, including WPI's federal loan default rate, its six-year graduation rate (89% versus 55% national average), and the percentage of first-year students returning for the sophomore year (95% versus 75% national average). The OSA&FL website has resources in English and Spanish to assist families in applying for and deciphering their aid. The office also offers a financial literacy program, called Gomponomics, which covers loan borrowing, student debt, personal finance, and fiscal management. The program includes such topics as budgeting, credit and credit cards, investments, managing finances, and loans and repayments. Each graduating student participates in exit counseling for federal and institutional loans. WPI's loan default rates are very low (federal loan default rate is less than 1%, compared to the national average of 9.7%).

In 2020, Student Affairs partnered with Advancement to create the Emergency Assistance Fund (EAF) and has been successful in establishing several endowed funds over the last 10 years that directly support students. They focus on meeting basic needs (such a food insecurity), unexpected financial issues, and innovative student-focused initiatives. The Undergraduate and Graduate Student Governments have provided significant financial contributions to the EAF. Since its founding, the EAF has awarded 114 grants totally over $102,000.

5.5 Social Equity, Diversity, and Inclusion

The program must demonstrate its commitment to diversity and inclusion among current and prospective faculty, staff, and students. The program must:

5.5.1 Describe how this commitment is reflected in the distribution of its human, physical, and financial resources.

Program Response:
As a critical step in promoting diversity, equity, and inclusion (DEI), WPI has instituted a campus-wide initiative known as Project Inclusion, guided by the New England Resource Center for Higher Education (NERCHE) Self-Assessment Rubric for the Institutionalization of DEI in Higher Education. Finalized in 2020, WPI has devoted 3 years to engaging students, faculty, and staff in a campus-wide self-assessment designed to guide DEI actions, processes, and strategic plans towards long-term structural and cultural change. The self-assessment rubric has steered the community along six dimensions (1. Philosophy and Mission, 2. Faculty Support, 3. Curriculum, 4. Staff Support, 5. Student Support, 6. Administrative Leadership) to understand the campus climate as it relates to DEI and determine our strategic priorities and commitments. For each dimension, three-stages of development have been established: emerging, developing, and transforming. Progression through the stages show that WPI is moving closer to fully institutionalizing diversity, inclusion, and equity on campus. To determine the stage in each dimension, WPI established a series of steering committees as well as the DEI Council (in year 3) tasked with gathering and assessing institutional data in each of the 6 dimensions. The data gathered provided useful information for the development of recommendations to advance DEI on campus and served as the foundation of the diversity plan. The full report can be found at:
https://www.wpi.edu/sites/default/files/2020/10/19/3.%20WPI%20PI%20DEI%20Year%201-3.pdf

The undergraduate architectural engineering program at WPI currently counts about 100 students, of which about 60% are female and 40% are male students. This ratio has been quite

consistent over the years, and we expect this trend to extend also into the graduate program. Most of WPIs and AREN students come from the New England region, while the program also attracts students from across the country and from abroad. An incoming AREN undergraduate class currently counts for about 25 students each year, and typically includes foreign students (1 or 2) as well as students from underrepresented minorities (2 to 3 in most recently admitted classes).

5.5.2 Describe its plan for maintaining or increasing the diversity of its faculty and staff since the last accreditation cycle, how it has implemented the plan, and what it intends to do during the next accreditation cycle. Also, compare the program's faculty and staff demographics with that of the program's students and other benchmarks the program deems relevant.

Program Response:
The program has made a concerted effort to attract faculty members with diverse backgrounds and ethnicities, to represent the diversity found in the program's student population. All search committees are required to include a diversity advocate, which has led to our most recent hires being predominantly female. For the faculty that are most closely affiliated with the program, these represent various ethnic backgrounds (Belgium, China, India, Iran, USA), and approximately 37% of the faculty are female (full-time and part-time combined). The program aspires to expand the diversity of the faculty and staff as the program grows.

5.5.3 Describe its plan for maintaining or increasing the diversity of its students since the last accreditation cycle, how it has implemented the plan, and what it intends to do during the next accreditation cycle. Also, compare the program's student demographics with that of the institution and other benchmarks the program deems relevant.

Program Response:
Worcester Polytechnic Institute primarily attracts students from the New England area. As a university with a strong focus on engineering disciplines, more students have historically been male. The fraction of female students at the undergraduate level has however gradually risen over the decades (31% in 2013 vs 43% in 2022). The percentage of underrepresented minorities (URM) at WPI has historically been relatively low. About 13% of students seeking a bachelor's degree at WPI come from underrepresented minorities in 2022, in comparison to about 17% at the state's flagship public university.

At WPI the AREN program has been an outlier with respect to its student gender distribution. Over 60% of the program's students have been female since the program was launched. This ratio has been quite consistent over the years, and we expect this trend to hold also for students enrolling in the new program. Most of our students come from the New England region, while the program also attracts students from across the country and from abroad. An incoming AREN undergraduate class currently has about 25 students each year, and typically includes foreign students (1 or 2) as well as students from underrepresented minorities (2 to 3 in most recently admitted classes). This trend has been consistent with university trends.

5.5.4 Document what institutional, college, or program policies are in place to further Equal Employment Opportunity/Affirmative Action (EEO/AA), as well as any other social equity, diversity, and inclusion initiatives at the program, college, or institutional level.

Program Response:
In line with our commitment to Equal Employment Opportunity/Affirmative Action (EEO/AA) and broader social equity, diversity, and inclusion, WPI has established comprehensive institutional, college, and program policies that prioritize these principles.

Our institution embraces Equal Opportunity Employment principles and actively seeks to enhance workforce diversity. We ensure that all qualified candidates are considered for employment regardless of factors such as race, color, age, religion, sex, sexual orientation, gender identity, national origin, veteran status, or disability. At WPI, we value individuals with

diverse backgrounds and experiences, recognizing their potential to contribute to a culture defined by creativity, collaboration, inclusion, problem-solving, innovation, high performance, and change-making.

Our commitment to these ideals is exemplified through various initiatives at the program, college, and institutional levels:

1. **Strategic Pillars and Sustainable Inclusive Excellence (SIE) Action Plan:** WPI's strategic plan, "Lead With Purpose: 2021–2026," centers on Diversity, Equity, Inclusion, and Belonging (DEIB) in its Student Well-Being, Access, Affordability, and Our Inclusive Community pillars. The Sustainable Inclusive Excellence (SIE) Action Plan was introduced to foster a culture of inclusion and belonging across our campus. The plan engages the community, amplifies marginalized voices, and develops actionable plans for integrating DEIB principles throughout the institution. This plan is supported by the SIE committee, which serves as our university wide DEIB council.

2. **DEIB Strategic Plan and Division of Talent and Inclusion:** We are currently developing a DEIB strategic plan that aligns with our university's broader priorities. This plan, facilitated by the Division of Talent and Inclusion, will emphasize fostering an inclusive community and advancing DEIB principles in all aspects of our operations.

3. **Division of Talent & Inclusion/Human Resources and ODIME:** Our organizational structure, led by the Senior Vice President for Talent & Inclusion/Chief Diversity Officer, comprises units that promote DEIB. These include the DEIB unit and the Office of Diversity, Inclusion, and Multicultural Education (ODIME), which features identity centers fostering inclusivity and belonging.

4. **DEIB Staff Expertise and Services:** Our DEIB staff serve as thought partners, facilitate professional development, guide recruitment practices, and organize events to build a sense of community among faculty, staff, and students. Their expertise is foundational in enhancing the WPI experience for all.

5. **International House:** With a commitment to cultural diversity and social inclusion, the International House supports international students and scholars in their transition to U.S. society and academic culture through programs, services, and immigration support.

6. **Office of Accessibility Services (OAS):** OAS ensures students with disabilities receive necessary accommodations for academic and campus life. They promote self-advocacy, independence, and personal growth while fostering a more accessible campus environment.

7. **Veteran's Office and Identity-based Courses:** We support student Veterans and eligible dependents while offering identity and culturally based courses to enhance cultural competency and understanding of various social identity groups.

8. **Interactive Qualifying Project (IQP):** Our distinctive project-based curriculum exposes students to interdisciplinary problem-solving at the intersection of science and society, often in global contexts.

9. **DEIB Workshops and Support Groups:** ODIME and the DEIB unit conduct cultural competency training, support identity-based support groups, and host networking opportunities to empower students, faculty, and staff.

10. **Accessibility Network:** At WPI, we advocate for accessibility-related changes on campus and are expanding to include groups focused on Women-identified folks, Veterans, and Hispanic/Latino-identified individuals.

In essence, WPI is dedicated to fostering an environment that champions Equal Employment Opportunity, Affirmative Action, and broader social equity, diversity, and inclusion. Our multifaceted approach across programs, colleges, and institutions ensures that these principles are woven into the fabric of our campus culture and operations, empowering individuals from all backgrounds to thrive and contribute meaningfully. For a more detailed summary of our past and current DEIB initiatives, please visit this page: https://hub.wpi.edu/WPISIE/Summary.

5.5.5 Describe the resources and procedures in place to provide adaptive environments and effective strategies to support faculty, staff, and students with different physical and/or mental abilities

Program Response:
WPI has established comprehensive resources and procedures to ensure that faculty, staff, and students with diverse physical and mental abilities are fully supported in adaptive environments. Our commitment to inclusivity and accessibility is reflected in the following processes:

Student Accommodations:
For students seeking classroom or academic accommodations, the Office of Accessibility Services (OAS) is the central point of contact. Our approach involves an interactive process, initiated by submitting supporting documentation. The OAS team then guides students through an intake process, understanding their unique needs, and collaboratively determining appropriate accommodations. These accommodations vary based on individual circumstances and documentation, so the exact resources are tailored to each student's requirements. Examples of potential accommodations encompass modifications within the course curriculum (such as extended exam time) or classroom location, ensuring that physical space accessibility needs are met.

Faculty and Staff Accommodations:
Requests from faculty and staff members for accommodation follow a similar process. These inquiries are directed through the Talent & Inclusion (T&I) department. Like the student-focused approach, accommodations for faculty and staff are personalized, with careful consideration of the individual's needs and the nature of their role. T&I collaborates with the individual to identify the most effective strategies for their situation.

Our commitment to fostering an inclusive environment extends beyond procedural support. We actively collaborate with individuals to understand their needs and provide solutions that optimize their experience within the educational and workplace settings. Our adaptive environments and strategies are designed to empower each person to achieve their full potential, irrespective of their abilities.

5.6 Physical Resources
The program must describe its physical resources and demonstrate how they safely and equitably support the program's pedagogical approach and student and faculty achievement. Physical resources include but are not limited to the following:

5.6.1 Space to support and encourage studio-based learning.

Program Response:
The program is primarily housed in Kaven Hall, which is home to the Department of Civil, Environmental, and Architectural Engineering. Kaven Hall has undergone a complete renovation during the pandemic, and as part of the renovation the program acquired renewed and enlarged studio spaces. In addition, the program also has studio spaces in Unity Hall, a new campus building that was completed in 2021. The program currently has access to 1400SF of studio space in Kaven Hall (KH207), 1400 SF of studio space in Unity Hall (UH220), and about 600 SF of dedicated faculty research laboratory space (UH220 a,b,c). All studio spaces are purpose-built with individual student desks, each desk with computer desktops with software needed for studio assignments. Studio spaces are entirely dedicated to studio use, no other courses are held in them.

Currently, the studio space in Kaven Hall is used primarily for studios 1,2, 3, and 5 while the studio space in Unity Hall is used for studio 4 and capstone studio design work. As the Master of Architecture programs grows it is our plan to reserve usage of the studio space in Unity Hall

for students in the Master of Architecture Program. Doctoral level research is supported by dedicated laboratory space in Unity Hall (UH 220a,b,c), and these labs include thermally controllable space for human-subject thermal comfort research.

The program also has access to additional flexible space in Kaven Hall and across campus that may be considered for use as studio space as the need arises (KH202 – 1200SF). Other student support areas include a large student lounge (1400 SF) and adjacent TA/RA student lounges (1200SF). The program also has laboratory and shop spaces available in Kaven Hall and in other campus buildings with access to various 3D printing and laser cutting tools as well as other CNC processes and traditional metal and woodworking tools. Additional support areas include individual offices for faculty and staff, classrooms lecture halls, and presentation areas.

The WPI Interactive Media and Game Development (IMGD) Program also has computer labs with advanced simulation software and hardware. The IMGD space is adjacent to the program's studio space in Unity Hall, and we are seeking active collaboration with this program to benefit our students. The program is also considering collaborations with the Worcester Center for Crafts and the Worcester Art Museum, which are within walking distance of campus.

5.6.2 Space to support and encourage didactic and interactive learning, including lecture halls, seminar spaces, small group study rooms, labs, shops, and equipment.

Program Response:
In addition to studio spaces, the program has access to several large conference rooms that can be booked by students and faculty alike. There is a large student lounge in Kaven Hall that is used by students as a study and work area, is used for social events, and which is used as a public review and exhibition space. The student lounge is located next to the graduate student lounge, which has dedicated areas for individual graduate student desks (TAs, RAs), spaces for visiting students, and space for undergraduate peer learning assistants (PLAs). The program has a relatively large shop located at the ground level of Kaven Hall, which is shared with students and faculty from all academic programs within the department. The shop has space and equipment for mixing, forming, curing, and testing concrete. A concrete 3D printer was recently purchased. There is also a separate machine shop, with metal and woodworking tools that can be used by students. Students interested in using the shop and laboratory space are required to complete mandatory safety training, work with power tools is supervised by our department's dedicated lab technicians. There are also smaller shop areas within Kaven and Unity Hall that are accessible to our students. Equipment in these shops include 3D printers and modelmaking tools. There is a campus wide network of makerspaces where students have access to such tools like larger scale laser cutters, panel saws, and various 3D printing tools. Individual architectural studio spaces also have some 3D printing and cutting tools for modelmaking. The university has many different classroom types that can be reserved for courses, projects, and student events. The program's public guest lecture series are typically held in our largest Kaven Hall lecture room, which seats about 80 people. All classrooms are equipped with podium PCs and have overhead projectors and one or multiple screens. The tables and chairs in most classrooms can be easily reconfigured to accommodate different teaching formats. In addition to computers in individual studio spaces, the department also has two large computer labs that can be used for software tutorials. All students have access to smaller study areas across campus that can be booked for projects or individual work. Several venues are available on campus to organize larger social events, such as the Higgins house and gardens.

5.6.3 Space to support and encourage the full range of faculty roles and responsibilities, including preparation for teaching, research, mentoring, and student advising.

Program Response:
All full-time faculty members in the program have dedicated private offices located in Kaven Hall, the program also provides private office space in Kaven Hall for part-time and adjunct faculty. The offices are sufficiently large to have meetings with colleagues and students. All office spaces have large operable windows that provide ample daylighting and views of the outdoors. All offices have heating and cooling systems that are occupant controlled. The building is equipped with Wi-Fi for internet access to online teaching platforms and course materials. There are several conference rooms in Kaven Hall that can be easily booked by the faculty. The department maintains a common room for faculty which has coffee and tea, a refrigerator, and a microwave. The room also has various office supplies and equipment, such as a copy machine.

5.6.4 Resources to support all learning formats and pedagogies in use by the program.

Program Response:

The Master of Architecture program is delivered in-person and on campus. When students travel or are ill, for example, meetings are typically arranged using online meeting platforms such as Zoom and Teams.

Software and hardware needs of the program are coordinated with the WPI Academic and Research Computing Group (Information Technology), who maintains a maintenance schedule for studio PCs and software. This group also offers instruction for a number of scientific and engineering software applications (SESA) which are essential to science and engineering curriculum and research activity. SESA instruction is non-credit academic support provided free of charge to all WPI students and faculty. Some of the typical resources are listed below.

Training sessions offered:
- MATLAB Crash Course
    - MATLAB Lecture 1: Getting started (introduction to the environment, variables, functions)
    - MATLAB Lecture 2: 2D plotting and user defined functions
    - MATLAB Lecture 3: 3D plotting and structures

- Introduction to Python programming

- Introduction to the Linux command line interface

- Introduction to High Performance Computing (HPC)

- Introduction to Git

- Engineering and scientific simulation software: resources and best practices

- Getting Started with CAD

- Advanced (3D Printing) Rapid Prototyping & 3D Scanning

- Introduction to ANSYS Structural

- Introduction to ANSYS Fluent (Fluid Dynamics)

- Introduction to COMSOL Multiphysics

Self-paced online courses:

- Intro to MATLAB: Self-paced online training with certificate of completion, https://wpi.catalog.instructure.com/browse/arc/courses/intro-to-matlab
- Intro to LaTeX: Self-paced online training with certificate of completion, https://wpi.catalog.instructure.com/browse/arc/courses/latex
- Intro to Python: Self-paced online training with certificate of completion, https://wpi.catalog.instructure.com/browse/arc/courses/introduction-to-python

Additional training resources:
- Academic and Research Computing (SESA Training) CANVAS page: https://canvas.wpi.edu/courses/4453
- SESA for Projects: https://canvas.wpi.edu/courses/25476
- Request a one-on-one consultation: https://arc.wpi.edu/consultation-request/

If the program's pedagogy does not require some or all of the above physical resources, the program must describe the effect (if any) that online, off-site, or hybrid formats have on digital and physical resources.

Program Response:
Not applicable

5.7 Financial Resources
The program must demonstrate that it has the appropriate institutional support and financial resources to support student learning and achievement during the next term of accreditation.

Program Response:
The new Master of Architecture program is growing out from the existing undergraduate program in Architectural Engineering (AREN). The AREN program today has grown to approximately 100 undergraduate students and is currently supported by 4 full-time faculty and several part-time faculty members. The major also receives substantial support from faculty in the CEAE department, who support courses in such areas as structural engineering, construction, professional practice, and who also co-advice undergraduate capstone design projects (MQP). The M. Arch. program is also supported by affiliated faculty members from various schools and departments at WPI (see Part Three – Supplemental Information: ii. Faculty Resumes).

The program and CEAE department, working with WPI's Associate VP of Academic Affairs, has developed a financial plan that projects student growth and corresponding expense and revenue projections for the M. Arch program. Considerations in budgeting include projected enrollment, revenues (tuition and fees), expenditures (cost for full and part time faculty, tuition discounts, staff, and other expenses), and the resulting net revenue. The plan predicts a positive cashflow for the program during the first year of implementation. At WPI, the Associate VP of Academic Affairs is responsible for the financial oversight of the divisions, including strategic planning, budgeting, space management, assessment of resource allocations and effectiveness, and the development of short- and long-term funding strategies for divisional academic programs. The Associate VP Academic Affairs works closely with the provost, deans, and department heads to provide financial oversight and guidance. The draft financial resource plan is included in the table below, it will be used to plan resource allocations as the program grows.

	5 year Master of Architecture + Bachelor Architectural Engineering pro forma cost and revenue										
	Revenue										
	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34
1st year AREN UG	25	27	29	31	33	35	37	39	41	43	45
2nd year AREN UG	25	25	27	29	31	33	35	37	39	41	43
3th year AREN UG	25	25	25	27	29	31	33	35	37	39	41
4th year AREN UG	25	25	25	25	27	29	31	33	35	37	39
M-Arch Program		8	10	12	14	16	18	20	22	24	26
Total Students #	100	110	116	124	134	144	154	164	174	184	194
UG revenue	$ 5,796,000	$ 5,911,920	$ 6,143,760	$ 6,491,520	$ 6,955,200	$ 7,418,880	$ 7,882,560	$ 8,346,240	$ 8,809,920	$ 9,273,600	$ 9,737,280
Graduate revenue	0	$ 309,120	$ 386,400	$ 463,680	$ 540,960	$ 618,240	$ 695,520	$ 772,800	$ 850,080	$ 927,360	$ 1,004,640
TOTAL revenue	$ 5,796,000	$ 6,221,040	$ 6,530,160	$ 6,955,200	$ 7,496,160	$ 8,037,120	$ 8,578,080	$ 9,119,040	$ 9,660,000	$10,200,960	$10,741,920
	Expenses										
UG Tuition discount	$(2,898,000)	$(2,955,960)	$(3,071,880)	$(3,245,760)	$(3,477,600)	$(3,709,440)	$(3,941,280)	$(4,173,120)	$(4,404,960)	$(4,636,800)	$(4,868,640)
Tuition Graduate discount	0	$ (61,824)	$ (77,280)	$ (92,736)	$ (108,192)	$ (123,648)	$ (139,104)	$ (154,560)	$ (170,016)	$ (185,472)	$ (200,928)
T/TT/TTT (FTE)	4	4	4	4	4	5	5	5	5	5	6
NTT (FTE)											
Adjunct - Studio courses (FTE)	4	5	5	6	6	7	8	10	10	10	10
Adjunct - lecture based courses	1	1	1	1	1	2	2	2	2	2	2
Total Faculty cost	$ (637,500)	$ (645,000)	$ (645,000)	$ (652,500)	$ (652,500)	$ (817,500)	$ (825,000)	$ (840,000)	$ (840,000)	$ (840,000)	$ (990,000)
staff				$ (60,000)	$ (60,000)	$ (60,000)	$ (60,000)	$ (60,000)	$ (60,000)	$ (60,000)	$ (60,000)
Other	$ (24,000)	$ (26,400)	$ (29,040)	$ (31,944)	$ (35,138)	$ (38,652)	$ (42,517)	$ (46,769)	$ (51,446)	$ (56,591)	$ (62,250)
Accreditation costs	$ (6,000)		$ (10,000)		$ (10,000)						$ (10,000)
Total expenses	$(3,565,500)	$(3,627,360)	$(3,755,920)	$(3,990,204)	$(4,235,238)	$(4,625,592)	$(4,868,797)	$(5,119,889)	$(5,356,406)	$(5,593,391)	$(5,990,890)
Net gross Income	$ 2,230,500	$ 2,593,680	$ 2,774,240	$ 2,964,996	$ 3,260,922	$ 3,411,528	$ 3,709,283	$ 3,999,151	$ 4,303,594	$ 4,607,569	$ 4,751,030

5.8 Information Resources

The program must demonstrate that all students, faculty, and staff have convenient and equitable access to architecture literature and information, as well as appropriate visual and digital resources that support professional education in architecture.

Program Response:

Since opening in 1968, the George C. Gordon Library at WPI has been a central resource for the campus, unifying WPI's original departmental reading collections. Today it provides all WPI students and faculty with free access to an exceptionally deep and broad virtual collection of journals, books, and media supporting work across multiple disciplines. Digital collections include over 250 databases, over 1.3 million digital books, over 225,000 digital media works, and over 240,000 digital journals, all searchable through the library's website. All digital resources are easily accessed off campus through central authentication services using WPI credentials. Library users have access to over 200,000 print volumes in browsable shelves in the building.

Architectural materials found in these collections include over 800 journals, including hundreds of digital journals, an estimated 7400 ebooks, 2500 conference proceedings, and 9000 print items:

	NA - Architecture	TH - Building construction	HT - Planning, Urban studies	TA - Civil engineering	HD - Real estate, land use	TOTAL
Print items	1571	1427	124	5724	383	9229
Ebooks	2632	1616	2732	1	432	7413
eJournals	349	159	224	2	68	802
Conferences	98	150	119	2121	15	2503
Total	4650	3352	3199	7848	898	19947

Additional titles and volumes are available in related fields such as design, art, and architectural history. Major databases available include JSTOR, Scopus, ASCE Library, GreenFILE, Engineering Village, and Humanities International Complete. The University Archives and Special Collections Department has historical records of regional construction companies, historical

photographs, and a collection of fine arts, prints, media, and rare books and illustrations, including a distinctive research collection on the world and works of Charles Dickens.

Local and Network Resources: Students and faculty may request any items not owned by WPI through our free interlibrary loan service. Area libraries, including those rich in visual arts (Holy Cross's Dinand Library and the library of the Worcester Art Museum) offer borrowing or walk-in user privileges. The library participates in the [Eastern Academic Scholars' Trust](#) (EAST) shared print network that provides access to over 10 million print volumes held in an expanding network of Eastern U.S. libraries.

Information Services for Teaching and Research: Research, course, and project support services are provided 115 hours a week when the library is open to WPI students and faculty. Assistance is available from professional librarians 55 hours a week, with research consultations and instructional services offered by a team of five research and instruction librarians, supplemented by other librarians and archivists as well as trained student employees. These services are available in person, via chat, email, and zoom. Librarians prepare digital course guides and subject guides in collaboration with teaching faculty. An example is this guide to [Architectural Engineering](#) research.

Other Resources: The Library provides designated quiet study and active group work spaces, including student project and team meeting spaces ("Tech Suites"). Students have access to computing workstations and scanners as well as on-site IT help. The library offers exhibition and arts spaces suitable for displaying student work. The Library's digital repository, Digital WPI, publishes student research and projects from all WPI students, as well as digital versions of rare imprints and historical and manuscript materials from the University Archives.

Plans are underway to create, by fall 2024, a browsable, curated collection of core architectural books drawn from our current collection, in a visible and attractive area on the library's upper floor. This architecture browsing collection will offer space for display of some architectural models as well as soft seating to encourage students to explore the collection and learn about the new graduate program.

Further, the program must demonstrate that all students, faculty, and staff have access to architecture librarians and visual resource professionals who provide discipline-relevant information services that support teaching and research.

Program Response:
The library's Research & Instruction team has been able to fill several vacancies this spring, making it possible by fall 2024 to assign responsibility for coordinating support for the Architecture faculty and students to one of our librarians, as part of their portfolio of responsibilities for interdisciplinary research and project support. In fall 2024 the library will submit a new FY25 request for funding to add access to Avery Index and ARTSTOR.

6—Public Information

The NAAB expects accredited degree programs to provide information to the public about accreditation activities and the relationship between the program and the NAAB, admissions and advising, and career information, as well as accurate public information about accredited and non-accredited architecture programs. The NAAB expects programs to be transparent and accountable in the information provided to students, faculty, and the public. As a result, all NAAB-accredited programs are required to ensure that the following information is posted online and is easily available to the public.

6.1 Statement on NAAB-Accredited Degrees

All institutions offering a NAAB-accredited degree program or any candidacy program must include the exact language found in the NAAB Conditions for Accreditation, 2020 Edition, Appendix 2, in catalogs and promotional media, including the program's website.

Program Response:
Upon candidacy, the program will include the exact language found in the NAAB Conditions for Accreditation, 2020 Edition, Appendix 2, in catalogs and promotional media, including the program's website.

6.2 Access to NAAB Conditions and Procedures

The program must make the following documents available to all students, faculty, and the public, via the program's website:

a) Conditions for Accreditation, 2020 Edition
b) Conditions for Accreditation in effect at the time of the last visit (2009 or 2014, depending on the date of the last visit)
c) Procedures for Accreditation, 2020 Edition
d) Procedures for Accreditation in effect at the time of the last visit (2012 or 2015, depending on the date of the last visit)

Program Response:
Upon candidacy, the program will make the Conditions for Accreditations (2020 edition) and the procedures for accreditation (2020 edition) available to the public via the program's website.

6.3 Access to Career Development Information

The program must demonstrate that students and graduates have access to career development and placement services that help them develop, evaluate, and implement career, education, and employment plans.

Program Response:
All WPI students have access to several career development resources. First, all WPI students are supported by WPI's Career Development Center, which assists students in their search for internships, co-ops, and full-time employment. Second, the CEAE department holds an annual networking event that is tailored towards connecting students to CEAE alumni and professional firms; the event is specifically designed to enable internship and job searches for students. Third, the program facilitates additional networking opportunities for students to meet with the program's industry advisory board throughout the academic year. Finally, and more recently, the program also launched its "Day in Practice" initiative to expose and connect students to different forms of practice, which we anticipate may also lead to career opportunities.

6.4 Public Access to Accreditation Reports and Related Documents

To promote transparency in the process of accreditation in architecture education, the program must make the following documents available to all students, faculty, and the public, via the program's website:

a) All Interim Progress Reports and narratives of Program Annual Reports submitted since the last team visit
b) All NAAB responses to any Plan to Correct and any NAAB responses to the Program Annual Reports since the last team visit
c) The most recent decision letter from the NAAB
d) The Architecture Program Report submitted for the last visit
e) The final edition of the most recent Visiting Team Report, including attachments and addenda
f) The program's optional response to the Visiting Team Report
g) Plan to Correct (if applicable)
h) NCARB ARE pass rates
i) Statements and/or policies on learning and teaching culture
j) Statements and/or policies on diversity, equity, and inclusion

Program Response:

Upon candidacy, the program will make the required documents (items a trough j) available to all students, faculty, and the public, via the program's website.

6.5 Admissions and Advising

The program must publicly document all policies and procedures that govern the evaluation of applicants for admission to the accredited program. These procedures must include first-time, first-year students as well as transfers from within and outside the institution. This documentation must include the following:

a) Application forms and instructions
b) Admissions requirements; admissions-decisions procedures, including policies and processes for evaluation of transcripts and portfolios (when required); and decisions regarding remediation and advanced standing
c) Forms and a description of the process for evaluating the content of a non-accredited degrees
d) Requirements and forms for applying for financial aid and scholarships
e) Explanation of how student diversity goals affect admission procedures

Program Response:

a) Application forms and instructions for graduate school are available at https://www.wpi.edu/admissions/graduate

b) Admissions requirements; admissions-decisions procedures, including policies and processes for evaluation of transcripts and portfolios (when required); and decisions regarding remediation and advanced standing are described in section 4.3 (Evaluation of Preparatory Education). This information will be finalized and made available via the program's website.

c) Forms and a description of the process for evaluating the content of a non-accredited degrees Forms and a description of the process for evaluating the content of non-accredited degrees will be finalized and made available via the program's website.

d) Requirements and forms for applying for financial aid and scholarships can be found at: https://wpi.cleancatalog.net/financial-aid

e) Explanation of how student diversity goals affect admission procedures can be found at: https://www.wpi.edu/about/diversity-equity-inclusion

6.6 Student Financial Information

6.6.1 The program must demonstrate that students have access to current resources and advice for making decisions about financial aid.

Program Response:
Resources and advice for making decisions on financial aid and scholarships can be found at:
https://wpi.cleancatalog.net/financial-aid
https://www.wpi.edu/admissions/tuition-aid/types-of-aid/scholarships-grants
https://www.wpi.edu/student-experience/resources/academic-advising/fellowships-scholarships/graduate

6.6.2 The program must demonstrate that students have access to an initial estimate for all tuition, fees, books, general supplies, and specialized materials that may be required during the full course of study for completing the NAAB-accredited degree program.

Program Response:
Estimates for the cost of attendance can be found at:
https://www.wpi.edu/admissions/tuition-aid/cost-attendance

NAAB

APPENDIX

i.   Eligibility Memorandum

NAAB

NATIONAL ARCHITECTURAL ACCREDITING BOARD, INC.
107 S West St, Suite 707 | Alexandria, VA 22314
info@naab.org | 202.783.2007 | www.naab.org

December 12, 2023

Arthur Heinricher, Ph.D.
Interim Senior Vice President and Provost
Worchester Polytechnic Institute
Boynton Hall
100 Institute Road
Worcester, MA 01609

Sent via email to heinrich@wpi.edu

Dear Dr. Heinricher,

At their December 7-8, 2023, meeting, the directors of the National Architectural Accrediting Board (NAAB) reviewed the application for eligibility for candidacy for the Worcester Polytechnic Institute Master of Architecture program.

Based on the NAAB review, the proposed professional architecture degree program, Master of Architecture (171 semester credits), has been accepted as eligible for candidacy. An on-site visit for initial candidacy will be scheduled for fall 2024. This visit will be conducted under the provisions of the *2020 NAAB Conditions for Accreditation* and the *2020 NAAB Procedures for Accreditation*.

The program is required to submit an Architecture Program Report (APR) for Initial Candidacy six months before the date of the visit to NAAB at accreditation@naab.org. As the program is developing its APR- IC, it must address all Conditions and sub-conditions. NAAB will provide more information on the APR and the site visit to the program director in a follow-up communication.

If you have any questions, please contact the NAAB office at accreditation@naab.org.

Sincerely,

Stephen Schreiber, FAIA, NCARB, DPACSA
President

cc: Dave Hoffman, FAIA, NCARB, Director, NAAB
       Jeffrey L. Day, FAIA, NCARB, Director, NAAB
       Dr. Steven Van Dessel, Associate Professor & Program Director

ii. Plan for Achieving Initial Accreditation

Please follow this link to view the Plan for achieving Initial Accreditation:

https://www.wpi.edu/sites/default/files/2024-04/WPI-NAAB-Eligibility-Application-and-Plan-for-Achieving-Initial-Accreditation.pdf

> Note: Course descriptions are included in the appendix of the plan for achieving Initial accreditation – please follow link above

iii. One-Page Faculty Resumes

Overview Table: Courses Taught vs Faculty

Faculty / Course Tracking Table:
Faculty resumes are included for faculty teaching Professional and Optional Studies courses

Page	Faculty	Course
FY 1100		Great Problems Seminar (GPS)*
AREN 2002		Architectural Design I
AREN 2004		Architectural Design II - Light and Lighting systems
AREN 3002		Architectural Design III
AREN 3020		Architectural Design IV - Building Energy Simulation
AREN 3022		Architectural Design V - Building Envelope Design
		Major Qualifying Project (MQP)
		Interactive Qualifying Project (IQP)
ARCH 501		Thesis Design - Architectural Design Advising / co-advising
		Thesis Design - Focus Area co-Advising
ARCH 500		Thesis Research seminar
AREN 2023		Introduction to Architectural Engineering Systems
AREN 3003		Introduction to HVAC design
AREN 3006		Advanced HVAC design
AREN 2025		Building Electrical Systems
CE 2000		Analytical Mechanics 1
CE 2001		Analytical Mechanics 2
CE 2002		Introduction to analysis and design
CE 3006		Design of steel structures
CE 3008		Design or reinforced concrete structures
CE 3010		Structural Engineering
CE 3041		Soil Mechanics
CE 3044		Foundation Engineering
CE 524		Finite Element Method and Applications
CE 510		Structural Mechanics
CE 514		Continuum Mechanics
CE 519		Advanced Structural Analysis
CE 524		Advance Finite Element Method
CE 531		Advanced Design of Steel Structures
CE 534		Structural Design for Fire Conditions
CE 3020		Project Management
CE 3025		Project Evaluation
CE 501		Professional Practice (required – 3 credits)
CE 580		Advanced Project Management
CE 584		Advanced Cost Estimating Procedures
HU 3900		Inquiry Seminar
ID 2050		Social Science Research for the IQP
ENV 130x		Smart and Sustainable Cities
AR 2114		Modern Architecture in the American Era, 1750-2001 and beyond
AR 2115		Topics in Architecture Since 1960
AR 3112		Modernism, Mass Culture, and the Avant-Garde
HI 1311		Introduction to American Urban History
HI 2310		Topics in Urban History
HI 331X		Urban Ecology and Environmental Justice
CE 3070		Urban and Environmental Planning
CE 4071		Land use Development and Controls
CE 590		Community and Environmental Planning
ENV 2201		Planning for Sustainable Communities
ENV 2710		Designing for Climate Resilience and Justice
ENV 3999		Permeability of Urban Design
IGS 501		Theorizing Place, Community, and Global Environmental Change
IGS 505		Qualitative Methods for Community-Engaged Research
IGS 510		Human Dimensions of Global Environmental Change
IGS 590		Capstone Seminar: Comparative Climate Action

Faculty columns (with page numbers): 89 Aaron Sakulich, 88 Suzanne LePage, 86 Nima Rahbar, 87 Mingjiang Tao, 85 Leonard D. Albano, 84 Jessica Anne Rosewitz, 83 Tahar El Korchi, 82 Lauren Ebert, 81 Sarah Strauss, 80 Derren Rosbach, 79 Stephen McCauley, 78 William San Martin, 77 Elisabeth Stoddard, 76 Katherine Foo, 75 Melissa Malouf Belz, 74 Joseph Cullon, 73 Miles David Samson, 72 Matthew Robinson, 71 Clyde Robinson, 70 Navneet Anand, 69 Nan Ma, 68 Soroush Farzin, 67 Shichao Liu, 66 Steven Van Dessel

NAAB

Name: STEVEN VAN DESSEL

Courses Taught (Four semesters prior to current visit):
AREN 2023 Introduction to Architectural Engineering, AREN 3022 Architectural Design V, Building Enclosure Design, Major Qualifying Project (capstone projects), AREN3999 Independent Study (Responsive Urban Environments Workshop, Polytechnic of Milan, Lecco Campus, Italy), CE598 Directed Research, CE699 PhD Thesis

Educational Credentials:
2000 DOCTOR OF PHILOSOPHY, University of Florida, Gainesville, FL, Architecture / Material Science
1990 DIPLOMA OF ARCHITECT, Sint Lukas Instituut, Schaerbeek (Brussel), Belgium

Teaching Experience:
2015 - present   Associate Professor, Dir. Architectural Engineering, WPI, MA
2008 - 2015   Associate Professor, Department of Architecture, Ghent University, Ghent, Belgium
2006 - 2007   Associate Professor, School of the Built Environment, University of Nottingham, UK
2000 - 2006   Assistant Professor, School of Architecture, Rensselaer Polytechnic Institute, Troy, NY
1997 - 2000   Graduate Assistant, Department of Architecture, University of Florida, Gainesville, FL

Professional Experience:
1997 - 1997   Architect, ABETEC NV Architects & Engineers, Zele, East Flanders, Belgium
1993 - 1997   Project Manager, Vadak BVBA , Boortmeerbeek, Belgium
1993 - 1997   Architect, Boortmeerbeek, Belgium
1992 - 1993   Architect-in-training, Provinciebestuur Brabant, Brussel, Belgium
1990 - 1992   Architect-in-training, Geens & Verbeeck Architects, Mechelen, Belgium

Licenses/Registration:
1992-present   Registered Architect (Belgium)
2014-present   Construction Supervisor License (unrestricted), MA

Selected Publications and Recent Research:
- El Ouaragli J, Xiao Z, Tao M, Granados-Focil S, Van Dessel S. A novel passive polymer-sorbent thermal battery for low-temperature energy applications: A numerical feasibility study. Journal of Energy Storage. 2022 December.
- Van Dessel, S., Tao, M., & Granados-Focil, S. (2020). Bioinspired Building Envelopes. In Bioinspired Structures and Design (pp. 343-354). Cambridge: Cambridge University Press.
- Mishra P, Stockmal K, Ardito G, Tao M, Van Dessel S, Granados-Focil S. Thermo-optically responsive phase change materials for passive temperature regulation. Solar Energy. 2020 February.
- Guldentops G, Van Dessel S. A numerical and experimental study of a cellular passive solar facade system for building thermal control. Solar Energy. 2017 June.
- Xu X, Van Dessel S. Evaluation of a prototype active building envelope window-system. Energy and Buildings. 2008; 40(2).

Other Work: Design of WW1 memorial, Green Hill Park, City of Worcester MA (2021)
Selected Grants (PI): 2017-2022 Adaptive Building Enclosure Systems Using Cellular SS-PCM (NSF, 359k), *Solar Decathlon (Morocco) 2019* (500k), *Solar Decathlon (China) 2013* (800k), *Solar Decathlon (USA) 2011* (450k), *2005-2008 Thin-film Active Building Envelopes* (NSF, 300k), *2001-2004 Active Building Envelopes* (NSF, 280k), *2001-2004 Rigidified Pneumatic Composites* (NSF, 150k)
Professional Memberships:
AIA, Order of Architects (Belgium), Architectural Engineering Institute (Academic Council)

NAAB

Name: SHICHAO LIU

Courses Taught (Four semesters prior to current visit):
AREN 3020 Architectural Design IV - Building Energy Simulation; AREN 3024 Building Physics; Major Qualifying Project (capstone projects); Independent Study (topics determined with students)

Educational Credentials:
2014 DOCTOR OF PHILOSOPHY, The University of Texas at Austin, Austin, TX, Civil Engineering/Built Environment
2009 MASTER of SCIENCE, Tianjin University, Tianjin, China
2007 BACHELOR of SCIENCE, Tianjin University, Tianjin, China

Teaching Experience:
2018 - present   Assistant Professor, Architectural Engineering, Worcester Polytechnic Institute, MA
2017 - 2017   Guest Instructor, Environmental Control Technology, Laney College, Oakland, CA
2016- 2016   Guest Instructor, Center for Built Environment, University of California Berkeley, Berkeley, CA
2010 - 2014   Graduate Assistant, Civil Engineering, The University of Texas at Austin, Austin, TX,

Professional Experience:
2009 - 2010   Research Assistant, Building Service Engineering, The Hong Kong Polytechnic University, Hong Kong, China

Licenses/Registration:

Selected Publications and Recent Research:
–   Liu, S., Mak, C.M. and Niu, J., 2011. Numerical evaluation of louver configuration and ventilation strategies for the windcatcher system. Building and environment, 46(8), pp.1600-1616.
–   Chen, W., Liu, S., Gao, Y., Zhang, H., Arens, E., Zhao, L. and Liu, J., 2018. Experimental and numerical investigations of indoor air movement distribution with an office ceiling fan. Building and Environment, 130, pp.14-26.
–   Liu, S., Schiavon, S., Das, H.P., Jin, M. and Spanos, C.J., 2019. Personal thermal comfort models with wearable sensors. Building and Environment, 162, p.106281.
–   Guo, X., Lee, K., Wang, Z. and Liu, S., 2021. Occupants' satisfaction with LEED-and non-LEED-certified apartments using social media data. Building and Environment, 206, p.108288.

Selected Grants (PI):
Responsive environmental design for learning (NSF, 300K); Students' mental health during COVID (NSF, 200K); Effects of car interior environment on driving performance (Ford Inc., 50K)

Professional Memberships:
American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); International Society of Indoor Air Quality and Climate (ISIAQ); The American Association for Aerosol Research (AAAR)

Name: SOROUSH FARZIN

Courses Taught (Four semesters prior to current visit):

AREN2002 Architectural Engineering Design Studio 1; AREN 3002 Architectural Engineering Design Studio 3; FY 1100 Great Project Seminars–Shelter the World, Major Qualifying Project (capstone projects), Independent Study (Interactive Architecture Design), Interactive Qualifying Project (interdisciplinary Projects)

Educational Credentials:

2016	Ph.D. in Regional Planning, University of Massachusetts Amherst
2016	Master of Architecture, University of Massachusetts Amherst
2009	Master of Architecture Technology, Tarbiat Modares University, Tehran, Iran
2006	Bachelor of Architecture, Shahid Beheshti University, Tehran, Iran

Teaching Experience:

2021 – Current	Assistant Professor of Teaching (Worcester Polytechnic Institute)
2017 – 2021	Assistant Teaching Professor (Worcester Polytechnic Institute)
2016 – 2017	Adjunct Teaching Professor (Worcester Polytechnic Institute)
2011 – 2015	Design Studio Assistant, University of Massachusetts Amherst

Professional Experience:

2006 – Present	Independent Design and Consultant Work
2013 – 2016	Green Building Researcher, Campus Planning, UMass, Amherst
2009 – 2010	Associate Architect Parsomash Consulting Engineers, Tehran, Iran
2008 – 2009	Assistant Architect Space Strategy Designers Studio, Tehran, Iran
2007 – 2009	Designer Abnieh Tarahan Alborz Consulting Engineers, Tehran, Iran

Selected Publications and Recent Research:

1. Farzinmoghadam, M., Mostafavi, N., Hamin, E., & Hoque, S., Developing an unsupervised method for the application of LIDAR data in IUMAT Land-use Model: Analysis of land-use changes in Amherst, Massachusetts using Building-form parameterization, GIS, and Artificial Neural Networks, Journal of Green Building: Winter 2019, Vol. 14, No. 1, pp. 1-30.
2. Mostafavi, N., Farzinmoghadam, M., & Hoque, S. (2017) Urban Residential Energy Consumption Modeling in the Integrated Urban Metabolism Anal. Tool (IUMAT), Building and Env., 114, 429-444.
3. Mostafavi, N., Farzinmoghadam, M., & Hoque, S., (2014) A framework for integrated urban metabolism analysis tool (IUMAT), Building and Environment, 82, 702-712.
4. Mostafavi, N., Farzinmoghadam, M., Hoque, S., & Weil, B., (2014) Integrated urban metabolism analysis tool (IUMAT), Urban Policy and Research, 32(1), 53-69.
5. Mostafavi, N., Farzinmoghadam, M., & Hoque, S. (2015). Envelope retrofit analysis using eQUEST, IESVE Revit Plug-in, and Green Building Studio: a university dormitory case study. International Journal of Sustainable Energy, 34(9), 594-613.

Creative work and Art Installation: PEACE (2023), The Waltz of Sadness (2020), Breathing While Black (2020), Immersive Space (2019), Epistemic Wall (2019), UMass September 11 Intervention (2014)

Selected Grants (PI): Personal Emotional Augmented Controlled Environment to Mitigate Stress (WPI Responsible Innovation Seed Grant Program, $50k), Adaptive Kinetic Architectural Design to Regulate Human Emotional States(WPI TRIAD Grant, $60K), Renewable Energy, Just Energy Transitions, and Energy Democracy (WPI Innovation Grant, $17k), Promoting architectural design skills through collaborative learning enabled by AR (WPI,$10K), Measuring the Impact of the COVID-19 Pandemic on STEM Student Engagement (co-PI NSF, $200k).

NAAB

Name: NAN MA

Courses Taught (Four semesters prior to current visit):

AREN3003 Principles of HVAC System Design; Major Qualifying Project (capstone projects)

Educational Credentials:

2022	Ph.D. in Architecture, University of Pennsylvania
2017	Master of Architecture, University of Melbourne
2015	Bachelor of Environments, University of Melbourne

Teaching Experience:

2022 -	Assistant Professor, Worcester Polytechnic Institute - present
2019 - 2021	Teaching Fellow, University of Pennsylvania
2018	Instructor, University of Melbourne

Professional Experience:

2017	Living Building Challenge Workshop, International Living Future Inst.
2017	Architectural intern, Cox Architecture, Melbourne, Australia
2017	Design Assistant, Architectural Design & Research Institute at South China University of Technology, Guangzhou, China
2015	The Architectural Association Visiting School Barcelona, Spain

Licenses/Registration:

Assoc. AIA, American Institute of Architects (AIA)

Selected Publications and Recent Research:

1. Ma, N.*, Zhang, Q., Murai, F., Braham, W. W., & Samuelson, H. W. (2023). Learning building occupants' indoor environmental quality complaints and dissatisfaction from text-mining Booking. com reviews in the United States. *Building and Environment*, 237, 110319.
2. Ma, N., Waegel, A., Hakkarainen, M., Glass, L., Braham, W.W., & Aviv, D. (2023). Blockchain + IoT sensor network to measure, evaluate and incentivize personal environmental accounting and efficient energy use in indoor spaces. *Applied Energy*, 332, 120443.
3. Ma, N.*, Hakkarainen, M., Hou, M., Aviv, D., & Braham, W. W. (2022). Impacts of building envelope design on indoor ozone exposures and health risks in urban environments. *Indoor and Built Environment*, 1420326X221112010.
4. Kang, Y.[1], Ma, N.[1], Bunster, V., Chang, VWC., & Zhou, J. (2022). Optimizing the Passive House Planning Package simulation tool: A bottom-up dynamic approach to reduce building performance gap. *Energy and Buildings* 267, 112512.
5. Ma, N.*, Chen, L., Hu, J., Perdikaris, P., & Braham, W.W. (2021). Adaptive behavior and different thermal experiences of real people: A Bayesian neural network approach to thermal preference prediction and classification. *Building and Environment*, 198, 107875. (Best Paper Award).
6. Ma, N.*, Aviv, D., Guo, H., & Braham, W.W. (2021). "Measuring the right factors: A review of variables and models for thermal comfort and indoor air quality". *Renewable and Sustainable Energy Reviews* 135, 110436.

Professional Memberships:

Since 2022	American Institute of Architects (AIA), Association for Computing Machinery (ACM)
Since 2021	American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
	International Building Performance Simulation Association (IBPSA)
	International Society of Indoor Air Quality and Climate (ISIAQ)

NAAB

Name: NAVNEET MAGON ANAND

Courses Taught (Four semesters prior to current visit)**:**

AREN 2004 Architectural Design ll - Light and Lighting Systems, AREN 3020 Architectural Design IV - Building Energy Simulation, DEV 510/ 520 Design Studio - master's in science and technology in social Innovation for global development.

Educational Credentials:

2013 - Masters in Business Administration in Sustainability and Green Building, San Francisco Institute of Technology, California

2007-LEED Certification - United States Green Building Council

1997 - Bachelor of Science in Architecture - McGill University, Montreal, Canada

Teaching Experience:

2020-current Adjunct Professor - Worcester Polytechnic Institute

Professional Experience:

2013-present - Design Veritas Founder/CEO - Culture Change + Social Impact

2007-2013 - N Design - Architectural Design Consulting

2001-2004 - Dario Designs Inc, Framingham, MA - Architectural Designer 2000-2001 - Gorman Richardson Lewis Architects, Hopkinton, MA - Architectural Designer

1999-2000 - Shepley Bulfinch Richardson & Abbot, Boston MA, Architectural Designer

2022 - SXSW EDU - project recognition - 'Community Engagement & Design'

2020 - Created Impact, Founder, A mission-based arm of Design Veritas

2017 - Mitchell Gold + Bob White Collaboration - Conscious Culture & Design

Selected Publications & Recent Research

1. 2013 - Book 'Conscious Design, Art & Inspiration...Creating Change' 2016 - Research- The Conscious Sustainability Standard- a future forward, innovative and human centered approach for designing products, programs, masterplans and environments.

2. 2016 - Research: Conscious Design -Developed The Conscious Design Model, a conscious methodology to designing spaces for full human potential, wellness and sustainability in designed environments.

3. 2018 - Research - The Created Impact Lab - a new approach to creative thinking while empowering solutions through creativity and design for a better future and world. 2019 - Research - Designing a Culture of Wellbeing and Sustainability-Developed The Everyday Environments Program - a human centered approach to everyday designed environments.

4. 2020- Research - Community Engagement and Design: South High Community High School Case study

5. 2022 - Research - Designing an Intentional Culture for Inclusion: A Case Study on Developing/Designing School Culture for a Diverse Socio-Economic, Cultural, and Immigrant Population 2023- Research - The Future of Work

6. + The Next Generation- Preparing the next generation with creativity and human centered skills for the future of work. 2023- Research -The Future of Work + The Work Life Journey- Creating a human centered approach for designing cultures for the future of work.

7. 2016 - TEDx speaker 'We Are Creators, Designing a New Culture'

Professional Memberships:

Assoc. AIA 2023- American Institute of Architects - MA Representative for the National Associates Committee, 2010 - present - Board Member - American Institute of Architects Central Massachusetts Chapter, 2015 - present - Chair, Sustainability Committee - American Institute of Architects Central Massachusetts Chapter, 2016 - 2018 President, American Institute of Architects Central Massachusetts Chapter, 2016-2018 - Conscious Capitalism, Boston Chapter

NAAB

Name: CLYDE ROBINSON

Courses Taught (Four semesters prior to current visit):
Architectural Design II – Light and lighting systems

Educational Credentials:
B.A., Chemistry, Salem State College, Salem, MA, 1976

Teaching Experience:
WPI, Adjunct Instructor, Dept. CEAE, 2014-current, part-time

Professional Experience:
SK & Associates, Lighting Designer, applications and lighting calculations, lighting layouts, 2013 – present,
Sladen Feinstein Integrated Lighting, Lighting Designer, lighting design, lighting calculations and modeling, layouts and specifications, 2011 – 2012
Lux Lighting Design, Senior Designer Associate, lighting design, lighting calculations and modeling, layouts and specifications, 2010 – 2011
Ripman Lighting Consultants, Project Manager, lighting design, lighting calculations and modeling, layouts and specifications, 2006 – 2010
Berg/Howland Associates, Lighting Designer, lighting design, lighting calculations and modeling, layouts and specifications, 2001 – 2006
HMFH Architects, drafter, model maker, 1996 – 2001

Licenses/Registration:
Lighting Certified (LC) National Council on Qualifications for the Lighting Professions
LEED Accredited Professional U.S. Green Building Council

Selected Publications and Recent Research:
Honors and Awards
IES Boston Section Service Award (2017)
IES Paul Waterbury Award of Merit for Exterior Lighting (2013)
IES Paul Waterbury Award of Merit for Exterior Lighting (2012)
IES Edwin F. Guth Awards (2) of Merit for Interior Lighting (2012)
IES Edwin F. Guth Award Boston Section for Interior Lighting (2007)
IES Edwin F. Guth Award Boston Section for Interior Lighting (2006)
IES Paul Waterbury Award of Excellence for Exterior Lighting (2004)

Service Activities
Treasurer, IES Boston Section (2016-2020)
President, IES Boston Section (2011-2014)
Vice President, IES Boston Section (2010-2011)
Secretary, IES Boston Section (2008-2010)

Selected Recent Research: Grants (Co-PI/Senior Personnel):

Professional Memberships:
Illuminating Engineering Society (IES)

NAAB

Name: MATTHEW ROBINSON

Courses Taught (Four semesters prior to current visit)**:**
AREN 2025: Building Electrical Systems

Educational Credentials:
D. Eng – Pennsylvania State University (In progress, anticipated graduation 2026)
Master's degree: Electrical Power Engineering – Northeastern University (2012)
Bachelor's degree: Electrical and Computer Engineering – Northeaster University (2007)

Teaching Experience:
2013-Present   Adjunct Professor, Architectural Engineering Program, Worcester Polytechnic Institute, MA

Professional Experience:
2023-Present   Senior Projects Manager, UMass Chan Medical School, Worcester MA
2013-2023   Senior Manager of Training and Development, Qualus Power Services, Westborough MA
2007-2013   Engineer 4, CDM Smith, Boston MA

Licenses/Registration:
Professional Engineer (PE), MA Home State (Current)
PMP Certification

Selected Publications and Recent Research:
N/A

Professional Memberships:
IEEE PES, PMI, NETA

NAAB

Name: MILES DAVID SAMSON
Associate Professor of Art History, Worcester Polytechnic Institute (WPI)
samson@wpi.edu

Courses Taught (Four semesters prior to current visit):

Modern Architecture in the American Era, 1750-9/11/2001 and Beyond (AR2114)
Topics in Architecture since 1960. (AR 2115)
The Collections of the Worcester Art Museum. (HU 3900-D02)
The Architecture of McKim, Mead & White and Their Times. (HU 3900 C-02)
Modernism, Mass Culture and the Avant-Garde. (AR 3112).

Educational Credentials:

University of Chicago, B.A. (History/Humanities), 1980
Harvard University, Ph.D., History of American Civilization Program, 1988

Teaching Experience:

Worcester Polytechnic Institute, Department of Humanities and Arts, 1991-present
Columbia University, School of Architecture, Planning and Preservation, 1990-91,
    adjunct faculty as Buell Fellow in American Architecture
Harvard University, Program on Degrees in History and Literature, tutor, 1982-90.

Professional Experience:

Resident Fellow, Cambridge Historical Society, 1982-1989. Responsible for house
museum tours in 1690 building, creation and leading of architectural tours, liaison with
preservation and archival professionals.

Selected Publications and Recent Research:

Pitched Battle: The Fate of the Roof in American Modernism. Book project in progress
Hut Pavilion Shrine: Architectural Archetypes in Mid-Century Modernism. Ashgate
    Press, 2015.
"Philip Johnson, Architecture, and the Revolution of the Text, 1930-34." *Interfaces* 24,
    "Text(e) et Architecture" (2006).
"'Unser New Yorker Mitarbeiter:' Lewis Mumford, Walter Curt Behrendt, and the
    Modern Movement in Germany." *Journal of the Society of Architectural Historians*,
    55, no. 2 (June 1996): 126-139.

Professional Memberships:

Society of Architectural Historians
College Art Association

Name: JOSEPH CULLON

Courses Taught (Four semesters prior to current visit):
HI 1311 Intro to American Urban History, HI 2310 Topics in Urban History: Postwar Cities, HI 3316 Topics in 20th C. US: AIDS Crisis, HI 339X/BBT239X Urban Ecology-Environmental Justice, HU 3900 Inquiry Seminar: Visions of the City, HU 3900 Inquiry Seminar: Riot and Rebellion in Urban

Educational Credentials:
2003 DOCTOR OF PHILOSOPY, University of Wisconsin-Madison, WI, History
1998 MASTERS OF ARTS, University of Wisconsin-Madison, WI, History
1995 MASTERS OF SCIENCE University of Wisconsin-Madison, WI, Land Resources
1991 BACHELORS OF SCIENCE, Cornell University, NY, Natural Resources

Teaching Experience:
2022 - present Professor of Teaching, Department of Humanities and Arts, WPI, Worcester, MA
2020 – present Associate Head for the Humanities, WPI, Worcester, MA
2017 – 2020   Assoc. Teaching Professor, Department of Humanities and Arts, WPI, Worcester, MA
2013 – 2017   Assis. Teaching Professor, Department of Humanities and Arts, WPI, Worcester, MA
2014-2017   Lecturer, Department of History, MIT, Cambridge, MA
2003-2013   Assistant Professor, Department of History, Dartmouth College, Hanover, NH

Selected Publications and Recent Research:
- Lead Author with Robert Deam Tobin and Stephanie E. Yuhl. *LGBTQ+ Worcester For the Record*. Worcester: Worcester Historical Museum, 2019. 116 pages. ISBN 978-1-884292-02-6
- "A River Transformed, A Valley Remade," in *Landscape of Industry: An Industrial History of the Blackstone Valley* (Hanover: University Press of New England for the Worcester Historical Museum, 2009).
- "Past as Prologue: The National Park Service and the Reintegration of the Blackstone Valley's History,"in *Landscape of Industry: An Industrial History of the Blackstone Valley* (Hanover: University Press of New England for the Worcester Historical Museum, 2009).
- "Legacies and Limitations: Environmental Historians Reconsider Progressive Conservation," *Journal of the Gilded Age and Progressive Era* (April 2002).
- "Empire of the Sea: The Ironies of Imperial Cartography." *Mapline* (Spring 2001).

Other Work:
- "Working with Communities to Tell Place-Based Stories," Invited Roundtable Participant for American Association for State and Local History Annual Conference, September 22-25, 2021, Little Rock, Arkansas
- "Using the Research Paradigm to Integrate Courses in Environmental History and Environmental Biology," Council on Undergradate Research, Virtual Biennial Conference, June 2020
- "Making Humanities Connections in Project-Based Learning," American Historical Association, Chicago, January 2019.
  "Building a Community-Based Digital Archive: The Trials, Tribulations, and Thrills of LGBTQ+intheWoo.org," Digital Commonwealth Conference, April 9, 2019.

Selected Grants (PI):
- Interdisciplinary Urban Humanities Cluster at WPI, NEH, 100k), 2017-2020
- Andrew W. Mellon Foundation Postdoctoral Fellowships, (OIEAHC, 50K), 2008-2009Andrew W.
- Mellon Foundation Post-Dissertation Fellowship, (AAS, 40K), 2005-2006, $40,000.

NAAB

Name: MELISSA MALOUF BELZ

Courses Taught (Four semesters prior to current visit):
ID2050 Social Science for the IQP, Interactive Qualifying Project (IQP) Advising and PQP, co-taught International Studies in Vernacular Architecture online course Indian Institute of Technology, Roorkee.

Educational Credentials:
2012 Ph.D., Kansas State University, Manhattan, KS, Geography
2000 MA, Oxford Brookes University, Oxford, England, International Vernacular Architecture, Regeneration, and Development
1995 MS, University of Massachusetts, Amherst, Environmental Design

Teaching Experience:
2018 – present   Associate Professor, Integrative and Global Studies, Worcester Polytechnic Institute, MA
2013 – 2018   Assistant Professor, Integrative and Global Studies, Worcester Polytechnic Institute, MA

Professional Experience:
2005 – 2009   Preservationist Crested Butte Heritage Museum, , Crested Butte, CO
2004 – 2007   Designer and Drafting Technician, Self-employed, Crested Butte, CO
2003 – 2009   Board of Zoning and Architectural Review, Crested Butte, CO
2002 – 2003   Energy Efficiency Specialist, UNDP, Ulaanbaatar, Mongolia
2001 – 2002   Drafting Technician. Resource Engineering Group Inc.. Crested Butte, CO

Selected Publications and Recent Research:

- Belz, Melissa M. (2024). Forest Policy, Deforestation, and Sustainable Development: A Himalayan Perspective. In The Encyclopedia of Vernacular Architecture of the World, Second Edition. Edited by Marcel Vellinga. London: Bloomsbury.
- Belz, Melissa M. (2024). Khash-Kanait (Himachal Pradesh, hill tribe architecture). In The Encyclopedia of Vernacular Architecture of the World, Second Edition. Edited by Marcel Vellinga. London: Bloomsbury.
- Belz, Melissa M. The Role of Decorative Features in the Endurance of Vernacular Architecture in Kinnaur, Himachal Pradesh, India. Geographical Review (2015);105(3):304-324.
- Belz, Melissa. Review of Potent Landscapes: Place and Mobility in Eastern Indonesia by Catherine Allerton. In Social and Cultural Geography. (2014);15(6): 687-688.
- Belz, Melissa M. Unconscious Landscapes: Identifying with a Changing Vernacular in Kinnaur, Himachal Pradesh, India. Material Culture (2013); Fall 45(2): 1-27.
- Belz, Melissa M. Review of Managing Cultural Landscapes edited by Ken Taylor and Jane L. Lennon. Routledge: London. In The Journal of Cultural Geography (2013); 30(1): 156-158.
- Malouf, Melissa. (2004). "Tell, Show, Do: Teacher Training Programs for Tomorrow's Housing Solutions." In *Building Without Borders, Sustainable Construction for the Global Village.*" Edited by Joseph Kennedy, pp 109-117. Gabriola, B.C.: New Society Publishers.

Professional Memberships:
Boston Preservation Alliance, Peer Reviewer for Endangered Wooden Architecture Program, Oxford Brookes University, Oxford, England.

NAAB

Name: KATHERINE FOO

Courses Taught *(Four semesters prior to current visit):*
ENV130x Smart and Sustainable Cities
IGS501 Theorizing Place, Community, and Global Environmental Change
ID2050 Social Science Research for the IQP
IQP Advising

Educational Credentials:
PhD in Geography, Clark University (2010-2015)
MLA (Master of Landscape Architecture), University of Michigan (2004-2008)
MS in Sustainable Systems, University of Michigan (2004-2008)
BA in Poverty Studies, Williams College (1998-2002)

Teaching Experience:
2022 – Present   Assistant Professor of Teaching, Global School, Worcester Polytechnic Institute, MA
2017-2022   Assistant Teaching Professor, Global School, Worcester Polytechnic Institute, MA
2015-2017   Postdoctoral Researcher, Department of Geography, The Pennsylvania State University
2010-2015   Graduate Research Fellow, Graduate School of Geography, Clark University

Professional Experience:
2008-2009   Landscape Architect, Carol R. Johnson Associates
2009-2010   Community Designer, Urban Ecology Institute, Boston

Selected Publications and Recent Research:
- Foo, Katherine. 2023. Regenerative cultures for sustainable cities and communities. *Research Agenda for Sustainable Cities and Communities.* Eds. K. McCormick, J. Evans, Y. Palgan, and N. Frantzeskaki. Northampton, MA: Edward Elgar Publishing.
- Foo, Katherine. 2021. Regenerative green infrastructure governance in weak, rebounding, and wealthy land markets. *Frontiers in Sustainable Cities.* Special Issue: Green Infrastructure and Regeneration: Towards a Multidisciplinary Research Agenda.
- Foo, Katherine. 2019. Visualizing Undisciplined Environments: an introduction. *Geoforum.* Special issue: Visualizing Undisciplined Environments, 102:230-286. [Guest Editor for special issue. 5 papers]
- Foo, Katherine, James McCarthy, and Anthony Bebbington. 2018. Activating landscape ecology: a governance framework for design-in-science. *Landscape Ecology,* 33(5), 675-689.
- Foo, Katherine. 2018. Examining the Role of NGOs in urban environmental governance. *Cities,* 77:67-72.
- Foo, Katherine. 2017. Institutionalizing Urban Possibility: urban greening and vacant land governance in three American Cities. In John Henneberry (Ed.), *Transience and Permanence in Urban Development.* Oxford, U.K.: Wiley-Blackwell.
- Foo, Katherine. 2017. Visualizing empathy, memory, and identity: a study of visual methods that challenge dominant scopic regimes in Boston, Raleigh, and Los Angeles. *Visual Methodologies.* Special Issue: Environmental (In)visibilities. 5(2): 35-49.
- Foo, Katherine, Emily Gallagher, Annette Kim, and Ian Bishop. 2015. Critical Landscape Visualization. *Landscape and Urban Planning.* Special Issue: Critical Landscape Visualization. 184:80-84. [Lead guest editor for special issue. 13 research papers and 4 commentaries]

Name: ELISABETH STODDARD

Courses Taught (Four semesters prior to current visit): ENV 2710: Designing for Climate Resilience and Justice; ENV 1100: Introduction to Environmental Studies; Master Qualifying Project: Designing a Sustainable Construction Process; Interactive Qualifying Projects: Design and Build projects for Nature-Based Education

Educational Credentials:
Ph.D. Geography, Clark University, Worcester, Massachusetts
M.S. Animals and Public Policy, Tufts University's Cummings School of Veterinary Medicine, North Grafton, Massachusetts
B.A. History Major, Sociology Minor, University of Vermont, Burlington, Vermont.

Teaching Experience:
2021-present Coordinator, Environmental and Sustainability Studies (ESS) Major, Social Science and Policy Studies Department, WPI
2019-2021 Co-Director, International Development, Environment, and Sustainability (IDEAS) Program, Social Science and Policy Studies Department, WPI
2021 – present Associate Professor of Teaching, Environmental and Sustainability Studies, WPI
2021 – present Director, Farm Stay Project Center, WPI

Professional Experience:
Consultant, World Animal Protection USA and Canada; Human, animal, and environmental impacts of engineered hog waste management and production systems

Licenses/Registration: N/A

Selected Publications and Recent Research:
National Science Foundation Grant, 2023 Broadening Participation Research Project: Investigating the Efficacy of Data Science for Environmental Justice based PBL Modules for Improving Diversity in Environmental Science
Eccles, Stephanie, **Elisabeth Stoddard,** and Mark Rice. "Engineered Biogas Systems and Rural Development in Eastern North Carolina: Power, Pollution, and Innovation. In *Development Engineering in Practice: Case Studies from around the World* by Wole Soboyejo, Yunus Teliel, and Rob Krueger. De Gruyter Academic Publishing. Book chapter accepted and in press; publication expected Summer 2023.
Stephanie Eccles and **Elisabeth Stoddard.** 2021. "Hurricane Florence's Impact: Policies on Animals Living in Confined Animal Feeding Operations in Eastern North Carolina". *Animals in Disasters*, World Animal Protection.
Stoddard, Elisabeth and Alice Hovorka. 2019. "Animals, vulnerability and global environmental change: The case of farmed pigs in concentrated animal feeding operations in North Carolina". *Geoforum*.
Wobbe, Kristin and **Elisabeth A. Stoddard** (co-editors). 2019. *Project-Based Learning in the First Year: Beyond All Expectations*, Stylus Publishers.
Professional Memberships: Advisory Board, Robert and Patricia Switzer Foundation, Association of American Geographers, Association for Environmental Studies and Science

NAAB

Name: WILLIAM SAN MARTIN

Courses Taught (Four semesters prior to current visit):
Environmental Justice in the Global Caribbean and Latin America, Climate Justice, Global Environmental Governance, Global Environmental Policy, Race and Environmental Justice, Extinctions, Social Sciences Research Methods

Educational Credentials:
2017 DOCTOR OF PHILOSOPHY, University of California, Davis, CA, History

Teaching Experience:
2022- present   Assistant Professor, Integrative and Global Studies, Worcester Polytechnic Institute
2018 - 2022   Assistant Teaching Professor, Humanities & Arts, Worcester Polytechnic Institute
2017 -2018   Postdoctoral Associate, Science, Technology & Society, Massachusetts Institute of Technology

Professional Experience:
2022-present   Research Fellow, Earth Systems Governance Project, Utrecht University, Netherlands
2021   Research Fellow, Rachel Carson Center for Environment & Society, Ludwig-Maximilians-Universität München, Munich, Germany
2017-2018   Postdoctoral Associate, Massachusetts Institute of Technology, Cambridge, MA, USA

Licenses/Registration: N/A

Selected Publications and Recent Research:
-Kanter, D; Graversgaard, Morten; Ahlström, Hanna; Liefferink, Duncan; Wiering, Mark: San Martin, W. A governance framework for better nitrogen management. In: International Nitrogen Assessment. Cambridge University Press (Forthcoming Q4, 2023).
-San Martin, W. Chile's Nitrogen Revolution: Experts, Institutions, and the Challenge for Agricultural Sustainability. In: Sanhueza, C., Valderrama, L. (eds) Historia de la Ciencia y la Tecnología en Chile, Vol. 3 Medioambiente. RIL Editores, Santiago, Chile (Forthcoming Q4, 2023).
-San Martín W, Wood N. Pluralising planetary justice beyond the North-South divide: Recentring procedural, epistemic, and recognition-based justice in earth-systems governance. Environmental Science & Policy. 2022 February; 128:256-263.
-San Martin, W. What the Environmental Governance Literature can tell us about Nitrogen Roadmaps. Presentation at the Workshop: Developing Roadmaps for Sustainable Nitrogen Management. Institut d'études Avancées de Paris, Paris, France May 18-20, 2022
-San Martín W. Global Nitrogen in Sustainable Development: Four Challenges at the Interface of Science and Policy. Encyclopedia of the UN Sustainable Development Goals. Cham: Springer International Publishing; 2020.
Selected Grants:
2023-2028 (CoPI) *Co-Producing Knowledge, Biotechnologies, and Practices to Enhance Biological Nitrogen Fixation for Sustainable Agriculture* (NSF, 2.6M), 2022 (PI) *Sustainable Development and the Global Nitrogen Challenge: Emerging Governance Actors, Policy Responses, and Socio-technological Conflict in the Global South* (Public Interest Technology Network, 3K), 2022 (PI) *Developing Roadmaps for Sustainable Nitrogen Management* (Organisation for Economic Co-Operation and Development, 3K), 2020-2023 (CoPI) Enhancing STEM Curriculum with Latin American and Caribbean Studies (U.S. Department Of Education 197K)

Professional Memberships:
Association for Environmental Studies & Sciences, American Society for Environmental History, Society for Social Studies of Science

NAAB

Name: STEPHEN McCAULEY

Courses Taught (Four semesters prior to current visit):
ID2050: Research Methods for the Social Sciences
ENV1500: Introduction to Geographic Information Systems
ENV2800/IGS596: GIS and Climate Resilience
Advised Interactive Qualifying Projects in Melbourne, Australia

Educational Credentials:
2009   Ph.D. (Geography), *Clark University, Worcester, MA*
2001   M.A. (Geography), *University of Maryland, College Park, MD*
1996   B.A., *High Honors* (Economics), *Loyola University, Baltimore, MD*

Teaching Experience:
2021 – present   Assoc. Prof. of Teaching, Integrative and Global Studies, *WPI, MA*
2020-2021   Assoc. Teaching Prof., Integrative and Global Studies, *WPI, MA*
2014-2020   Asst. Teaching Prof., Interdisciplinary and Global Studies, *WPI, MA*
2012-2013   Visiting Asst. Prof., Environmental Science and Policy Program, *Clark University, MA*

Professional Experience:
2023 – present Co-Director, Global Lab, *Worcester Polytechnic Institute, Worcester, MA*
2016 – present Co-Director, Melbourne Project Center, *Worcester Polytechnic Institute, Worcester, MA*
2018-2021   Co-Director, Global Lab, *Worcester Polytechnic Institute, Worcester, MA*
2010-2013   Research Associate, George Perkins Marsh Institute, *Clark University, Worcester, MA*
2011Postdoctoral Fellow, Research Institute for Humanity and Nature, *Kyoto, Japan*

Selected Publications and Recent Research:
- Brown, C., McCauley, S., Adler-Abramo, R. (submitted) Inclusivity Overlooked: Assessing People with Disabilities (PWDs) Representation in Climate Resilience Frameworks. Submitted to Journal of Policy Analysis and Management.
- Ahmed, W., I. Chatterjee, J. Funke and S. McCauley (forthcoming 2023) *Geography in the 21st Century: Conflicts and Disasters that Shaped Society*. Santa Barbara, CA: ABC-CLIO.
- McCauley, S. (forthcoming 2022) Hurricane Katrina: A Human Produced Disaster in New Orleans. In Ahmed, W., I. Chatterjee, J. Funke and S. McCauley, eds. *Geography in the 21st Century: Conflicts and Disasters that Shaped Society*. Santa Barbara, CA: ABC-CLIO.
- McCauley, S. and J. Stephens (2017) Changing Human Geographies of the Electricity
- Grid: Shifts in Power and Control in the Renewable Energy Transition. In: B. Solomon and
- K. Calvert, eds. *Handbook on Geographies of Energy*. Edward Elgar.

Selected Grants:
- Public Interest Technology – University Network / WPI JustT(ech) Collaborative Project Grant, 2022-2023, "Humanizing Visualizations of Urban Heat Impacts." Amount: $3,000 (PI)
- National Science Foundation, Sustainable Regional Systems – Research Network Program,
- Track 2 Planning Grant, 2021-22, "Land Use as a Mediating Factor in Regional Sustainability Transitions: Establishing a Network of Research and Practice across Urban and Rural Systems in Massachusetts". CoPI (with PI S. Tuler, CoPIs C. Eggleston, B. O'Connor, E. Stoddard, S. Strauss). Amount: $148,946

Professional Memberships:
Association for Environmental Studies and Sciences   2009-2012, 2023-date
Association of American Geographers   2001-2009, 2020-date

NAAB

Name: DERREN ROSBACH

Courses Taught (Four semesters prior to current visit): FY 1100 Seeking Sustainability, FY1100 Power the World, ENV 2201 Planning for Sustainable Communities, ID 2050 Social Sciences for the IQP, ENV 3999 Sustainable Economics and Policy, ENV 3999 Permeability of Urban Design, ENV 4400 Environmental Studies and Sustainability Senior Seminar

Educational Credentials:
2010   PhD, Environmental Design and Planning, Virginia Tech, Blacksburg, VA
2005   MS, Biology, Western Carolina University, Cullowhee, NC
1995   BA, Human Ecology, College of the Atlantic, Bar Harbor, ME

Teaching Experience:
2019- present   Associate Professor of Teaching, Integrative and Global Studies Department, Social Sciences and Policy Department, Civil and Environmental Engineering Department, Worcester Polytechnic Institute
2012-2016   Assistant Teaching Professor, Social Sciences and Policy Department, Civil and Environmental Engineering Department, Worcester Polytechnic Institute
2010-2012   Visiting Assistant Professor, Urban Affairs and Planning Department, Virginia Tech
2004-2005   Instructor, Geosciences & Natural Resources Department, Western Carolina University

Professional Experience:
2011-2013   Research Associate, Center for Geospatial Information Technology, Virginia Tech, Blacksburg, VA
2009-2010   Craft Brewer, Five Penny Organic Farm and Shooting Creek Brewery, Floyd, VA
2007-2009   Graduate Research Assistant, Virginia Bioinformatics Institute, Virginia Tech, Blacksburg, VA
2005-2006   Graduate Research Assistant, Urban Affairs and Planning Department, Virginia Tech, Blacksburg, VA
1999-2002   Vice President and Cofounder, Arts of Design Inc., Hilton Head Island, SC
1995-1995   Biological Technician, Acadia National Park, Bar Harbor, ME

Licenses/Registration: none

Selected Publications and Recent Research:
- Boudreau, K. & Rosbach, D. (2019). A Transdisciplinary Approach to Projects in K. Wobbe and L.
  Stoddard (eds.) *Project-Based Learning in the First Year: Beyond all Expectations*: Stylus.
- Pfeiffer, G. & Rosbach, D. (2015). The Great Problems Seminars: Connecting Students with External Stakeholders in Project-Based Approaches to Sustainable Development Education in the First Year. In W. L. Filho & L. Brandli (Eds.), *Engaging Stakeholders in Education for Sustainable Development at the University Level:* Springer.
- Rosbach, D., (2012). Building a Transdisciplinary Trading Zone. *The International Journal of Science in Society*, *Volume 3*, *Issue 3*, pp.17-30.

Selected Grants:
Developing the research facilities, shielding, and licensing strategy for a next- generation university hybrid 'research and power' nuclear reactor. (NRC, $500K) 2021-2024, Tatnuck Magnet Garden Rainwater Catchment System (4K) 2014-2015, Learning to teach project-based courses in the first year: Great Problems Seminars (255K) 2012–2015

Professional Memberships:
- Association of Environmental Studies and Sciences (AESS) 2014-2023

Name: SARAH STRAUSS

Courses Taught (Four semesters prior to current visit):

IGS 510, Human Dimensions of Global Environmental Change (2x); ID 2050, Social Science Methods for the IQP; IQP junior year interdisciplinary project advising for Monteverde, Costa Rica; MS and PhD student advising on research on climate adaptation in Massachusetts, Puerto Rico, and India.

Educational Credentials:

1997	Ph.D., Cultural Anthropology, University of Pennsylvania, Philadelphia, PA, USA
1987	M.P.H., Community Health, San José State University, San Jose, CA, USA
1984	A.B., Comparative Religion, Dartmouth College, Hanover, NH, USA

Teaching Experience:

2019- *Professor*, Department of Integrative and Global Studies, The Global School, WPI

2013-2019 *Professor of Cultural Anthropology.* Dept. of Anthropology, University of Wyoming

2012-13 *Visiting Professor*, Pondicherry University, Puducherry, India

2005-06 *Visiting Professor*, Department of Geosciences, University of Fribourg, Switzerland

1997-2013 *Assistant, then Associate Professor*, Dept. of Anthropology, University of Wyoming

Professional Experience:

2021-23 *Director*, Research and Graduate Studies, The Global School

2021-23 *Director*, Community Climate Adaptation graduate program

2018 *Acting Director*, Wyoming Institute for Humanities Research, University of Wyoming

2016-17 *Interdisc. Fellow*, Rachel Carson Center for Enviro & Society, LMU, Munich, Germany

2008-09 *Visiting Scientist*, National Center for Atmospheric Research, Boulder, CO

Licenses/Registration:

Selected Publications and Recent Research:

Strauss, S and C Kurlanska (in press), From Lone Ranger to Team Player: The role of anthropology in training a new generation of climate adaptation professionals. In Crate and Nuttall, *Anthropology and Climate Change*, 3rd edition. Routledge.

Boglioli, M, D Mueller, **S Strauss**, S Hoard, G Beeton, R Budowle (2022). Searching for Culture in "Cultural Capital": The Case for a Mixed Methods Approach to Production Facility Siting. *Fron. in Energy Research*, Sec. Bioenergy/Biofuels.

De Figueredo, A.R., Simões, J.C., Menegat, R., **Strauss, S.** and Rodrigues, B. (2019). Perceptions of and adaptation to climate change in the Cordillera Blanca, Peru. *Sociedade & Natureza*.

Strauss, S. and C. Eggleston (2019). Experimenting with Energyscapes. *Perspectives: Transformations in Environment and Society- Journal of the Rachel Carson Center for Environment and Society, 2019 (2).* Energizing the Spaces of Everyday Life. Eds. V. Taylor and H. Chappells.

Strauss, S., Rupp, S., and T. Love (eds.) (2013) *Cultures of Energy: Power, Practices, Technologies.* Walnut Creek, CA: Left Coast Press. **Book.**

Selected Recent Research: Grants (Co-PI/Senior Personnel):

2022 Caribbean Climate Adaptation Network: Building equitable adaptive capacities of the US Virgin Islands and Puerto Rico ($6,000,000 total; $674,254 for WPI). NOAA 09/012022. With PI Mimi Sheller.

2021 SRS-RN: Establishing a Network of Research and Practice to Support Governance in Linked Urban and Rural Systems of Massachusetts. PI Seth Tuler, $149,873. NSF # 2115335.

2019 WPI TRIAD Grant (with S. Liu, S. Djamasbi, G. Somasse). Decision making under enviro. stress.

Professional Memberships:

1987- American Anthropological Association (AAA)

1998- European Association for Social Anthropology

2005- Society for Applied Anthropology (Fellow)

2016- Royal Anthropological Institute (Fellow)

NAAB

Name: LAUREEN ELGERT

Courses Taught ENV2600: Environmental Problems in the Developing World; ENV1100: Introduction to Environmental Studies; GOV 2319: Global Environmental Politics; IGS596: Climate Adaptation Capstone; DEV1100: Introduction to Development Studies

Educational Credentials:
2011   London School of Economics, Ph.D. (International Development/Environmental Politics)
2003   University of Alberta, MSc. (Health Promotion)
1999   Trent University, BA, Honors (International Development and Anthropology)

Teaching Experience:
2017-Present   Associate Professor of International Development and Environmental Policy, WPI
2011-2017   Assistant Professor of International Development and Environmental Policy, WPI
2008-11   London School of Economics, Teaching Fellow, International Development Studies

Professional Experience:
2021- Department Head, Integrative and Global Studies, Worcester Polytechnic Institute
2020- Editor, Journal of Critical Policy Studies
2004-2011   Research Scientist, Alberta Research Council
2000-2004   Research Associate, Alberta Center for Injury Control and Research
2002 Research Assistant, Little Red River Cree Nation
1996-2002   Personal Banking Representative, Canadian Imperial Bank of Commerce
1994-2002   Inventory Controller, Retail Sales Associate, Gravity Pope

Selected Publications and Recent Research:
Gray, L., Elgert, L., Winkler Prins, A. (2020). Theorizing Urban Agriculture: North-South Convergence. Agriculture and Human Values, 37, 869-883.
Elgert, L. (2019). Promoting Global Competency in Engineering Education: Designing the 'Engineering Across Borders' Casebook. ASEAN Journal of Engineering Education, 3(1), 17-26.
Elgert, L. (2018). Rating the sustainable city: 'Measurementality', transparency, and unexpected outcomes at the knowledge-policy interface. Environmental Science & Policy, 79, 16-24.
Sakulich, A. R., & Elgert, L. (2017). Establishing Undergraduate Project Centers in Cuenca, Ecuador, and Panama City, Panama. Council on Undergraduate Research Quarterly, 37(3).
Elgert, L. (2016). The double edge of cutting edge: explaining adoption and non-adoption of the STAR rating system and insights for sustainability indicators. Ecological Indicators, 67: 556-564.
Elgert, L., P. Austin, K. Picchione. (2015). Improving Water Security through Rainwater Harvesting – A Case from Guatemala and the Potential for Expanding Coverage. International Journal of Water Resources Development, 32(5), 765-780.
Elgert, L. (2015). 'More Soy on Fewer Farms' in Paraguay: Challenging Neoliberal Agriculture's Claims to Sustainability. Journal of Peasant Studies, 43(2):537-561.
Elgert, L. (2013). Hard facts and software: The coproduction of indicators in a land-use planning model. Environmental Values, 22(6), 765-786.
Elgert, L., R. Krueger (2012). Modernizing sustainable development? Standardization, evidence and experts in local indicators. Local Environment 17(5), 561-571.

Professional Memberships:
Association for Environmental Science and Studies

Name: TAHAR EL-KORCHI

Courses Taught (Four semesters prior to current visit):
CE2002-Introduction to Analysis and Design; CE3010-Structural Engineering; CE4017-Prestressed Concrete; AREN3002-Architectural Design, MQP project-Structural Design of Terminal E-Logan Airport.

Educational Credentials:
Ph.D. 1987- Civil Engineering, University of New Hampshire.
M.S.   1982- Civil Engineering, University of New Hampshire.
B.S.   1980- Civil Engineering, University of New Hampshire.

Teaching Experience:
2019-Present Professor of CEA, Worcester Polytechnic Institute, Worcester, MA
1999-present, Professor, CEE, Worcester Polytechnic Institute, Worcester, MA
1992–1998, Associate Professor, CEE, Worcester Polytechnic Institute, Worcester, MA
1987–1992, Assistant Professor, CEE, Worcester Polytechnic Institute, Worcester, MA

Professional Experience:
2009-2019, Department Head, CEE, Worcester Polytechnic Institute, Worcester, MA
2014 – 2017, Interim Head Dept. of Fire Protection Engineering, WPI. Worcester, MA
2007-2009, Interim Dept Head, CEE, Worcester Polytechnic Institute, Worcester, MA
1993-1994, Visiting Associate Scientist, Turner Fairbank Highway Research Cntr, McLain, VA
2013-present; Visiting Professor at Hebei Univ. of Tech. Tianjin, China.
2016-2017; Co-Director WPI-Tsinghua Center for Global Public Safety.
2005-2020; C0-Director WPI-Morocco Project Center.
2009-2021; C0-Director WPI-Panama Project Center.

Licenses/Registration:
FE-Registration 1980.

Selected Publications and Recent Research:
1. Zhang M, Zhao M, Zhang G, El-Korchi T, Tao M. A multiscale investigation of reaction kinetics, phase formation, and mechanical properties of metakaolin geopolymers. Cement and Concrete Composites. 2017 April; 78:21-32.
2. Narain J, Jin W, Ghandehari M, Wilke E, Shukla N, Berardi U, El-Korchi T, Van Dessel S., Design and Application of Concrete Tiles Enhanced with Microencapsulated Phase-Change Material, Journal of Architectural Eng. V22, No.1,
3. Harmal A, Khouchani O, El-Korchi T, Tao M, Walker H. Bioinspired brick-and-mortar 2023 March; 137:104944-
4. Zhang M, Guo H, El-Korchi T, Zhang G, Tao M. Experimental feasibility study of geopolymer as the next-generation soil stabilizer. Construction and Building Materials. 2013 October; 47:1468-1478.
5. Zhang M, El-Korchi T, Zhang G, Liang J, Tao M. Synthesis factors affecting mechanical properties, microstructure, and chemical composition of red mud–fly ash based geopolymers. Fuel. 2014 October; 134:315-325.

Other Work:
Solar Decathlon (Morocco) 2019 (500k), 2011-2013 *Solar Decathlon (China) 2013* (800k),

Professional Memberships:
American Society of Civil Engineers, ASCE.

Name: JESSICA ANNE ROSEWITZ

Courses Taught (Four semesters prior to current visit):
ES 2501 Introduction to Static Systems, CE 2002 Introduction to Analysis and Design, CE 3008 Design of Reinforced Concrete Structures, CE 3010 Structural Engineering, CE 3020 Project Management, CE 3030 Fundamental of Civil Engineering Autocad, CE 501 Professional Practice, CE 580 Advanced Project Management, Interactive Qualifying Projects (junior year capstone project), Major Qualifying Projects (senior year capstone project)

Educational Credentials:
2020 DOCTOR OF PHILOSOPHY, Worcester Polytechnic Institute, Worcester, MA, Civil Engineering
2016 MASTER OF SCIENCE, Worcester Polytechnic Institute, Worcester, MA, Civil Engineering
2016 BACHELOR OF SCIENCE, Worcester Polytechnic Institute, Worcester, MA, Civil Engineering

Teaching Experience:
2021 – Present, Assistant Teaching Professor, Department of Civil, Environmental and Architectural Engineering, Worcester Polytechnic Institute, Worcester, MA
2018 – 2021, Adjunct Professor, Department of Civil, Environmental and Architectural Engineering, Worcester Polytechnic Institute, Worcester, MA
2021, Adjunct Professor, Department of Biological & Physical Sciences, Assumption College, Worcester, MA

Professional Experience:
2003 – 2014, Structural Engineer, CME Associates, Inc, East Hartford, CT
Licenses/Registration:
2012 – Present, Registered Professional Engineer, State of Massachusetts, USA

Selected Publications and Recent Research:
- Askarinejad, Sina; Wang, Shuai; Shalchy, Faezeh; Rosewitz, Jessica; Choshali, Habibeh A; Rahbar, Nima, Deformation and Toughening Mechanisms in Nacreous Structures, 2023, Elsevier
- Rosewitz, Jessica A; Wang, Shuai; Scarlata, Suzanne F; Rahbar, Nima, An Enzymatic Self-Healing Cementitious Material, Applied Materials Today, In press, In press, 2021, Elsevier
- Rosewitz, Jessica A; Choshali, Habibeh Ashouri; Rahbar, Nima, Bioinspired design of architected cement-polymer composites, Cement and Concrete Composites, 96, 252-265, 2019, Elsevier
- Rosewitz, Jessica; Rahbar, Nima, Advanced Conservation Methods for Historical Monuments, Advanced Materials for the Conservation of Stone, 27-55, 2018, Springer International Publishing
- Rosewitz, Jessica; Muir, Christina; Riccardelli, Carolyn; Rahbar, Nima; Wheeler, George, A multimodal study of pinning selection for restoration of a historic statue, Materials & Design, 98, 294-304, 2016, Elsevier

Patents: Rahbar, Nima; Scarlata, Suzanne Frances; Rosewitz, Jessica Anne, Method for enzymatic repair of cementitious surfaces, 2020, US Patent 10,647,617
*Selected Grants (co-PI):*2022-2023 WIN Undergraduate Summer Research Fellowship Program: Laying the foundation for successful women's careers in Science & Engineering (85k)
Professional Memberships:
Sigma Xi, 2016 – Present. American Society of Civil Engineering, 2011 – Present. American Society for Engineering Education, 2017 – Present.

NAAB

Name: LEONARD D. ALBANO

Courses Taught (Four semesters prior to current visit):
CE 2000 Analytical Mechanics I; CE 3006 Design of Steel Structures; Major Qualifying Projects (capstone design projects); CE 510 Structural Mechanics; CE 519 Advanced Structural Analysis; CE 534 Structural Design for Fire Conditions

Educational Credentials:
1992 DOCTOR OF PHILOSOPHY, Massachusetts Institute of Technology, Cambridge, MA /Structural Engineering
1983 MASTER OF SCIENCE, Northwestern University, Evanston, IL /Civil Engineering
1982 BACHELOR OF SCIENCE, Tufts University, Medford, MA /Civil Engineering

Teaching Experience:
1998 - present   Associate Professor, Department of Civil, Environmental, & Architectural Engineering, Worcester Polytechnic Institute, Worcester, MA
1992 - 1998   Assistant Professor, Department of Civil, Environmental, & Architectural Engineering, Worcester Polytechnic Institute, Worcester, MA
1992 - 1998   Part-Time Lecturer, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA

Professional Experience:
1988 – 2000   Structural Engineering Consultant.
1983 – 1988   Staff Engineer, Engineering Mechanics Division, Stone & Webster Engineering, Corp., Boston, MA
1982   Structural Engineering EIT, Bayside Engineering Associates, Boston, MA

Licenses/Registration:
1988-present   Professional Engineer, Commonwealth of MA

Selected Publications:
- Kim, Y., Bai, J.W., and Albano, L.D., "Fragility Estimates of Smart Structures with Sensor Faults," *Smart Materials and Structures*, 22(12), 2013.
- Mallick, R., Carelli, J., Albano, L., Bhowmick, S., and Veeraragavan, A., "Evaluation of the Potential of Harvesting Heat Energy from Asphalt Pavements," *International Journal of Sustainable Energy*, 4(2), pp. 164–171, 2011.
- Richard, M.J., Albano, L.D., Kelley, D., and Liel, A.B., "Case Study on the Seismic Performance of Reinforced Concrete Moment Frames Using ACE Design Provisions," *Proceedings, Structures Congress 2010*, Orlando, Florida, May 12 – 15, 2010.
- Quinn, K.A. and Albano, L.D, "Problem-Based Learning in Structural Engineering Education," *Journal of Professional Issues in Engineering Education and Practice*, 134(4), pp. 329-334, 2008.
- Albano, L.D., "Classroom Assessment and Redesign of an Undergraduate Steel Design Course: A Case Study," *Journal of Professional Issues in Engineering Education and Practice*, 132(4), pp. 306-311, 2006.

Professional Memberships:
Structural Engineering Institute, American Society of Civil Engineers; Sigma XI; Chi Epsilon; Tau Beta Pi

NAAB

Name: MINGJIANG TAO

Courses Taught (Four semesters prior to current visit):
CE3041 SOIL MECHANICS, CE 3044 FOUNDATION ENGINEERING, CE 590 ADVANCED GEOTECHNICAL ENGINEERING, Major Qualifying Project (capstone projects), Independent Study

Educational Credentials:
2003 Ph.D., Case Western Reserve University, Ohio, Civil Engineering
2000 MS, Tongji University, P. R. China, Geotechnical Engineering
1997 BS, Fuzhou University, P. R. China, Civil Engineering

Teaching Experience:

2016 – 2023	Associate Head,	Worcester Polytechnic Institute,	MA
2013 – present	Associate Professor,	Worcester Polytechnic Institute,	MA
2007 – 2013	Assistant professor,	Worcester Polytechnic Institute,	MA
2003 – 2007	Research Associate,	Louisianan Transportation Research Center,	LA

Professional Experience:

2003– 2007	Research Associate	Louisianan Transportation Research Center,	LA

Licenses/Registration:

2006-present	Licensed P. (LA)

Selected Publications and Recent Research:
- Harmal, Anass, Oussama Khouchani, Tahar El-Korchi, Mingjiang Tao, and Harold W. Walker. "Bioinspired brick-and-mortar geopolymer composites with ultra-high toughness." Cement and Concrete Composites 137 (2023): 104944.
- Zhang, Mo, Hongyan Xu, Armande Loraine Phalé Zeze, Xiongfei Liu, and Mingjiang Tao (2022). "Coating performance, durability and anti-corrosion mechanism of organic modified geopolymer composite for marine concrete protection." Cement and Concrete Composites 129: 104495.
- El Ouaragli J, Xiao Z, Tao M, Granados-Focil S, Van Dessel S. A novel passive polymer-sorbent thermal battery for low-temperature energy applications: A numerical feasibility study. Journal of Energy Storage. 2022 December; 56:105971.
- Van Dessel, S., Tao, M., & Granados-Focil, S. (2020). Bioinspired Building Envelopes. In Bioinspired Structures and Design (pp. 343-354). Cambridge: Cambridge University Press.
- Mishra P, Stockmal K, Ardito G, Tao M, Van Dessel S, Granados-Focil S. Thermo-optically responsive phase change materials for passive temperature regulation. Solar Energy. 2020 February.
- Guldentops G, Van Dessel S. A numerical and experimental study of a cellular passive solar facade system for building thermal control. Solar Energy. 2017 June.

Selected Grants (PI & Co-PI):
FMRG: Eco: Carbon-Inverted Manufacturing of Inverted Cements (CIMIC) (NSF, $2,998k), 2024 - 2027; Adaptive Building Enclosure Systems Using Cellular SS-PCM (NSF, 359k), 2011-2013; Collaborative Research: An Integrated Experimental and Computational, Multiscale Study of Geopolymers for Next Generation Soil Improvement, (NSF, $174k), 2013- 2016;

Professional Memberships: ASCE

NAAB

Name: NIMA RAHBAR

Courses Taught (Four semesters prior to current visit):
CE 3008 Design of Reinforced Concrete Structures, CE 4007 Matrix Structural Analysis, CE 514 Continuum Mechanics, CE 524 Advance Finite Element Method, CE 590 Fracture Mechanics

Educational Credentials:
2008 Ph.D., Princeton University, Princeton, NJ, Civil Engineering
2003 M.Sc., Northeastern University, Boston, MA, Civil Engineering
1998 B.Sc., Sharif University of Technology, Tehran, Iran, Civil Engineering

Teaching Experience:
2023 - present   White Family Professor, Depart. of Civil and Env. Eng., WPI, Worcester, MA
2012 - 2016   Associate Professor, Depart. of Civil and Env. Eng., WPI, Worcester, MA
2008 - 2012   Assistant Professor, Depart. of Civil and Env. Eng., UMass, Dartmouth, MA
2003 - 2008   Graduate Assistant, Depart. of Civil and Env. Eng., Princeton University, Princeton, NJ

Professional Experience:
1998 - 2000   SABA Structural Engineering Consultants, Tehran, Iran.

Selected Publications and Recent Research: 12 Book Chapters, 86 Publications, 5 patents, 60 invited talks, over 150 Conference presentations and proceedings

- Shuai Wang, Suzanne Scarlata, Nima Rahbar "A Self-Healing Enzymatic Construction Material," *Matter*, Volume 5, Issue 3, 957-974, 2022.
- Sina Askarinejad, Faezeh Shalchy, Nima Rahbar "Role of Interphase Properties in Mechanical Properties of Nacreous Structures," 2021, *Composite b*, 109255
- Jessica Rosewitz, Shuai Wang, Suzanne Scarlata, Nima Rahbar, "An Enzymatic Self-Healing Cementitious Material," 2021, *Applied Materials Today*, 23, 101035
- Jessica A. Rosewitz, Habibeh Ashouri Choshali, Nima Rahbar, "Bioinspired design of cement-polymer composites," *Cement and Concrete Composite* Volume 96, 2019, Pages 252-265
- ina Youssefian, Nima Rahbar, "Molecular Origin of Strength and Stiffness in Bamboo Microfibrils," *Nature-Scientific Reports* 5, 11116 (2015)
- Gert Guldentops et al. "Performance of a Pavement Solar Energy Collector: Model Development and Validation," *Applied Energy* Volume 163, 2016, Pages 180-189.
- Askarinejad Sina, Rahbar Nima "Toughening Mechanisms in Multilayered Bioinspired Materials." *Royal Society Interface*, 2014, Volume: 12 Issue: 104: 20140855.

Selected Grants (PI):
A Carbon Negative Self-Healing Enzymatic Construction Material (NSF, 700k), 2022-2025, Design and Synthesis of Materials for Agile Manufacturing 2019 (Co-PI, DoD, 1 mil), Enzymatic self-healing concrete," MassCEC Catalyst Program, 2019 (Mass CEC, 65k), Intelligent processing of materials by design," 2015 (Co-PI, DoD, 1 mil), Mechanics of Bio-inspired Multilayered Structures," 2012 NSF Faculty Early Career Development (CAREER)(NSF, 420 k)

Professional Memberships:
Associate Member of the American Society of Civil Engineers (ASCE), Sigma Xi Scientific Research Society, Society of Engineering Science (SES), and The Metals, Minerals, and Materials Society (TMS)

NAAB

Name: SUZANNE LePAGE

Courses Taught (Four semesters prior to current visit):
CE 3050 (Traffic Engineering)
CE 3070 (Urban & Environmental Planning)
CE 3074 (Environmental Analysis)
CE 4071 (Land Use, Development, and Controls)
CE 590 (Community and Environmental Planning)
Major Qualifying Project (capstone projects)
Independent Study (Planning & Land Development topics)

Educational Credentials:
2010, Master of Science, Civil Engineering, Worcester Polytechnic Institute
1995, Bachelor of Science, Civil Engineering, Worcester Polytechnic Institute

Teaching Experience:
2007 - present   Senior Instructor, Worcester Polytechnic Institute, MA

Professional Experience:
2004 - 2008   Regional Services Manager
                 Central Massachusetts Regional Planning Commission, Worcester, MA
2000 - 2004   Transportation Planning Consultant
                 Southern Maine Regional Planning Commission, Springvale, ME
1993-1998   Associate Transportation Planner
                 Central Massachusetts Regional Planning Commission, Worcester, MA

Licenses/Registration:
2012 – 2015; 2022-present   American Institute of Certified Planners (AICP)

Selected Publications and Recent Research:
1. LePage, Suzanne & Jonathan Cook, "Running Water," Chapter 8 in Beer Terrain: Field to Glass from the Berkshires to the Maine Coast, self-published, 2013.
2. LePage, Suzanne, "Environmental Mitigation in Transportation Projects," Chapter 27 in Pavement Engineering: Principles and Practice, 3rd Ed., Taylor & Francis, 2018.
3. Hart, Frederick, Klaas Rodenburg, and Suzanne LePage, "The Stantec Project Center: An Off-Campus Capstone Design Experience," Conference Proceedings, Capstone Design Conference, Boulder, CO June 7-9, 2010.
4. LePage, Suzanne, "An Investigation into the Water Quality Impacts of a Green Roof," poster presentation at the 7th Annual Water Resources Research Conference, Amherst, MA. April 8, 2010. (2nd Place award for poster)
5. Silvestri, Chiara, Suzanne LePage & Paul P. Mathisen, "Enhancing Instruction in Civil Engineering Courses with Use of Video-Streamed Tutorials." presented by S. LePage at the American Society for Engineering Education (ASEE) Northeast Section Conference 2010. Boston, MA, May 8, 2010.

Professional Memberships:
American Planning Association (APA)

Name: AARON SAKULICH

Courses Taught (Four semesters prior to current visit):
CE2020 (Introduction to Surveying), CE2001 (Analytical Mechanics II), CE3026 (Materials of Construction Laboratory), CE590 (Degradation of Infrastructure).

Educational Credentials:
2010 Ph.D. Drexel University, Philadelphia PA, Materials Science and Engineering
2005 B.S. Drexel University, Philadelphia PA, Materials Science and Engineering

Teaching Experience:
2017- current   Associate Professor, Worcester Polytechnic Institute
2012-2017   Assistant Professor, Worcester Polytechnic Institute

Professional Experience:
2010-2012   Visiting Researcher, National Institutes of Standards and Technology
2009-2010   Postdoctoral Scholar, University of Michigan

Licenses/Registration:

Selected Publications and Recent Research:
1. Sakulich, A.R., *Reinforced geopolymer composites for enhanced material greenness and durability.* Sustainable Cities and Society, 1 (2011) 195-210.
http://www.sciencedirect.com/science/article/pii/S2210670711000448
2. Sakulich, A.R., Bentz, D.P., *Mitigation of autogenous shrinkage in alkali activated slag mortars by internal curing.* Materials and Structures, (2012) 1-13. http://dx.doi.org/10.1617/s11527-012-9978-z
3. Bentz, D.P., Garboczi, E.J., Lu, Y., Martys, N., Sakulich, A.R., Weiss, W.J., *Modeling of the influence of transverse cracking on chloride penetration into concrete.* Cement and Concrete Composites, 38 (2013) 65-74. http://www.sciencedirect.com/science/article/pii/S095894651300022X
4. Bentz, D.P., Stutzman, P.E., Sakulich, A.R, Weiss, J.W., *Study of early-age bridge deck cracking in Nevada and Wyoming.* NIST Internal Report 7841, Department of Commerce (2012). 53 pages.
http://concrete.nist.gov/~bentz/NISTIR7841.pdf
5. Sakulich, A., Bentz, D.P., *Increasing the service life of bridge decks by incorporating phase-change materials to reduce freeze-thaw cycles*. Journal of Materials in Civil Engineering, 24 (2012)1034-1042.
http://concrete.nist.gov/~bentz/PCM_Paper_082411.pdf

Selected Grants (PI):
2016-2021 $296,581 – REU Site: Advanced Materials and Processes for a Resilient Society. National Science Foundation Research Experience for Undergraduates program. 2016-2017 $87,958 – Expanding opportunities for project-based learning in Latin America. U.S. Department of State. 2013-2017 – $248,275 IRES: Environmental impact of the Panama Canal expansion project. National Science Foundation Office of International Science and Engineering. 2013-2016 – $299,142 REU Site: Interdisciplinary Research on Sustainable Infrastructure Materials. National Science Foundation Division of Engineering Education and Centers.

Professional Memberships:
Council on Undergraduate research (councilor/division chair)

Name: CARRICK M. EGGLESTON

Courses Taught (Four semesters prior to current visit):
GE 2341, Geology, C term 2023, 2022; CE 575, Climate and the Earth System (A term 2023, 2022)

Educational Credentials:

Stanford University, Stanford, California; Applied Earth Sciences   Ph.D., June 1991
Dartmouth College, Hanover, New Hampshire; Earth Sciences   A.B., June 1983

Teaching Experience:

2019-   Professor and Department Head, Civil, Environmental, and Architectural Engineering, Worcester Polytechnic Institute, Worcester, MA
2016-2019 Department Head, Geology and Geophysics, University of Wyoming
2012-2013 Visiting Professor, Pondicherry University, Puducherry, India.
2010-2019 Associate Director and Adjunct Professor, Center for Photoconversion and Catalysis, School of Energy Resources, University of Wyoming.
2006-2019 Professor, Department of Geology and Geophysics, University of Wyoming.
2000-2006 Associate Professor, Dept. of Geology and Geophysics, University of Wyoming.
1995-2000 Assistant Professor, Dept. of Geology and Geophysics, University of Wyoming.

Professional Experience:

1994-1995 Postdoctoral Fellow, Lawrence Livermore National Laboratory, California.
1991-1994 Postdoctoral Fellow, EAWAG, ETH Zurich, Switzerland
1983   Geologist, Century Logging Consultants, Midland, Texas.

Licenses/Registration: N/A

Selected Publications and Recent Research:

Gure A.J., Dewey J.C., Eggleston C.M., Parkinson B.A. (2021) Trace Perchlorate Quantification in Small-Volume, High-Chloride Solutions. *ACS Earth Space Chem*. 5, 1325-1332.

Afolayan D.O., Eggleston C.M., Onwualu A.P., Adetunji A.R., Tao M. (2021) Physicochemical studies for risk identification of artisanal barite mining. Sustainability 13, 1-21.

Gure A., Sorenson T., Dewey J.C., Kraus T., Eggleston C.M., Parkinson B.A. (2019) Photoelectrochemical Generation of Perchlorate. ACS Earth. Space Chem. 3, 2171-2174.

Strauss S. and C.M. Eggleston (2019) Experimenting with energyscapes … RCC Perspectives, Journal of the Rachel Carson Center, V. Taylor and H. Chappells, eds.

Sudhakar S., Joshi D.N., Peera S.G., Sahu A.K., Eggleston, C.M., R. Arun Prasath (2018) Materials in Electronics. https://doi.org/10.1007/s10854-018-8661-8

Braun A., Hu Y., Boudoire F., Bora D.K., Sarma D.D., Graetzel M., Eggleston C.M. (2016) The electronic, chemical and electrocatalytic processes … Catalysis Today 260, 72-81.

Xu J., Sahai N., Eggleston C.M., Schoonen M.A.A. (2013) Reactive oxygen species at the oxide/water interface … Earth and Planetary Science Letters 363, 156-167.

Eggleston C.M., Stern J., Strellis T., Parkinson B.A. (2012) A natural photoelectrochemical cell for water splitting … American Mineralogist 97, 1804-1807.

Schuttlefield J.D., Sambur J.B., Gelwicks M., Eggleston C.M., Parkinson B.A. (2011) Photooxidation of chloride by oxide minerals… J. Am. Chem. Soc. Comm. 133, 17521-23.

Professional Memberships:

ASCE, Geotechnical, Structural, and Architectural