WORCESTER POLYTECHNIC INSTITUTE

May 7, 2024

To: WPI Faculty
From: Mark Richman
Secretary of the Faculty

The ninth Faculty meeting of the 2023-2024 academic year will be held on **Tuesday**, **May 7, 2024 at 11:00am in OH 107 and by Zoom at:** https://wpi.zoom.us/j/97659998486. Refreshments will be available in OH 107 at 10:45am.

1. Call to Order — M. Richman
   - Approval of the Agenda
   - Consideration of the Consent Agenda - including the minutes from April 11, 2024
2. Opening Announcements — M. Richman
3. President's Report — G. Wang
4. Committee Business:

   Committee on Academic Operations (CAO) — S. Van Dessel
   - **Motion to approve the May 2024 Undergraduate Student Graduation List**

   Committee on Graduate Studies and Research (CGSR) — S. Olson
   - **Motion to approve the May 2024 Graduate Student Graduation List**

   Committee on Governance (COG) — G. Heineman
   Committee on Appointments and Promotions (COAP) — W. Martin
   - **Motion to provide guidelines for initiating searches for new Dept. Heads and for the appointments and terms of Interim Dept. Heads** — P. Weathers

   Committee on Financial and Administrative Policy (FAP) — H. Walker
   Fringe Benefits Committee (FBC) — R. Dempski
   Committee on Governance (COG) — G. Heineman
   - **Motion to modify the membership on FBC and the representation in FBC deliberations**

   Committee on Governance (COG) — G. Heineman
   - **Motion to clarify eligibility for election to faculty governance committees based on administrative title**

   Committee on Academic Policy (CAP) — B. Calli
   - **Motion to clarify the academic standing policy for students on reduced course load**

   Committee on Graduate Studies and Research (CGSR) — S. Olson
   - **Motion to establish an M.S. program in Integrated STEM Education - including 4 new courses** — K. Chen, M. Dubosarsky
   - **Motion to establish an MS degree and BS/MS and Graduate Certificate programs in Explosion Protection Engineering** — A. Rangwala
5. New Business
6. Provost's Report — A. Heinricher
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WORCESTER POLYTECHNIC INSTITUTE
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April 11, 2024

Summary:

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2. Secretary of the Faculty's Report and Opening Announcements
3. President's Report
4. Committee Business: CITP; COG; COG/COAP; FAP/FBC/COG
5. Committee Report: COG
6. New Business
7. Provost's Report
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Detail:

1. Call to Order

The eighth Faculty Meeting of the 2023-2024 academic year was called to order at 3:15pm both in person and via ZOOM by **Prof. Richman** (AE). Prof. Richman reminded all those in attendance that the meeting was being recorded (for the purpose of taking accurate minutes, only). The meeting agenda, the minutes from the March 13th meeting, and 10 motions from CAO and 13 motions from CGSR in the consent agenda were approved with two minor changes. Prof. Richman explained that due to the many items on today's agenda, all presenters have strict time limits.

2. Secretary of the Faculty's Report and Opening Announcements

Prof. Richman congratulated President Wang on her March 22 inauguration. He added that, now that the elections to COG, CTAF, and COAP have been concluded, COG is soliciting interest from all faculty members as the committee puts the ballots together for the eight remaining at-large faculty governance committees. Prof. Richman encouraged everyone to think seriously about agreeing to have their name on a ballot. The goal is to complete the elections by the end of D-term.

Prof. Richman described the upcoming Faculty Honors Convocation (on April 26) as an event that brings us together as a community to celebrate the achievements of our colleagues, and he encouraged everyone to make the time to attend. Finally, Prof. Richman reminded everyone that our last faculty meeting is on Tuesday, May 7th at 11am.

Prof. Vernescu (VPRI) announced that we have two Provost candidates each coming to for two-day campus visits (on April 16-17 and April 22-23). The open presentations by the candidates for the community will be on April 17th from 11am-12:30pm and on April 23rd from 1-2:30pm. VPRI Vernescu encouraged all faculty members to participate by attending the open sessions and any other meetings to which they may have been invited. **Prof. Richman** pointed out that feedback will be collected through anonymous Qualtrics surveys after the interviews are completed, and that community response will be critical in assessing the candidates.

Dean Snoddy announced that commencement will be held at the DCU center on May 9th for graduate students and on May 10th for undergraduate students. The Earl Bridge crossing will take place at 2pm on May 7 after the last faculty meeting. In addition, the ROTC Commissioning ceremony will be held at 3pm in Alden Hall on May 8. Dean Snoddy emphasized the importance of faculty participation at as many of these ceremonies as possible.

3. President's Report

President Wang, in the interest of saving time today, explained that she had provided a thorough campus update at her Town Hall meeting on April 9th. She also congratulated Dr. Vernescu on his appointment as Vice President & Vice Provost for Research and Innovation.

President Wang provided an update on the challenges related to the delays in FAFSA information coming from the Department of Education, which have in turn caused difficulties for our Financial Aid Office. This is a nationwide problem, but any questions we hear from prospective WPI students and families should be directed to the Financial Aid Office for proper support. President Wang also emphasized that we are in peak season for graduate admissions, and she encouraged all departments to be responsive to all applicants.

4. Committee Business

Committee on Information Technology Policy (CITP)

Prof. Smith (IMGD, CITP Chair) presented on behalf of CITP. CITP recommended and she moved that the WPI Mailing List Policy be updated as described in the motion. Referring to an extensive report on a proposed mailing list policy that she presented at the October 2023 Faculty Meeting, Prof. Smith gave a brief update. The key elements of the proposed policy are as follows: 1) redefine our mailing lists to match current practice; 2) establish the idea of a list owner; 3) authorize the list owner to determine the options for list moderation; and 4) lay out the responsibilities of IT to ensure support, maintenance, and reliability of all lists. The current policy covers both dynamic lists (*dl-, adv-*) and individually managed lists (*gr-*). Since October, responses from faculty have helped CITP understand the many different ways the individually managed lists are being used. CITP concluded that a policy governing the *gr-* lists would likely have too many unintended consequences, and as a result, the current draft removes these lists from the proposed policy. The current draft now focuses the policy much more tightly on automated or automatable (*dl-* and *adv-*) mailing lists. The *gr-* mailing lists will be addressed in a future policy discussion. (See **Addendum #1** on file with these minutes.)

The other major change in the draft is that, rather than naming each standing list and its owner, the proposed policy now authorizes CITP in consultation with IT to determine list ownership. This change makes it possible to change a list owner without revising the entire policy. CITP in conjunction with ITS will determine the ownership of these standing lists and will maintain records that are internally accessible and transparent.

The policy governs list ownership for many lists: All department or program mailing lists will be owned by the department head, program director, or their delegate. All advising mailing lists will be owned by the Office of Academic Advising. All course mailing lists will be owned by the instructor of record and are made by request to IT.

Prof. Smith noted that a key piece of the policy includes the responsibilities of list owners. Owners are responsible for defining the population of their list. Ideally, this task can be automated, but when it can't be, list owners should alert ITS when there is a problem with membership or automation. List owners set the moderation policy, which can range from wide open to restricted. Owners must set the membership policy (opt-in or opt-out), transfer list ownership if they leave their position, report policy violations as they occur, and request list removal if it is no longer needed.

ITS, for its part, is responsible to proactively maintain necessary infrastructure; ensure accuracy and reliability of mailing lists; ensure that changes made to underlying data are reflected on lists within one business day; respond to requests from list owners for maintenance tasks; periodically and on request provide lists membership information to list owners in user-friendly and accessible format; create mailing lists upon request (when possible and in accordance with policy); communicate with list owners when changes to mailing list service may affect list communications; and refer list subscription requests to list owners.

This policy names the Potpourri mailing as an exception. Potpourri is an ownerless, opt-out list, such that everyone is automatically enrolled and can opt out at any time.

This motion passed.

Committee on Governance (COG)

Prof. Heineman (CS, COG Chair) introduced a motion for discussion only. The motion makes two changes to the Constitution and Bylaws section of the Faculty Handbook that clarify the eligibility for election to faculty governance committees based on administrative title, specifically identifying those who, as members of the administration, are ineligible to hold elected office. He presented an overview of the motion and its two parts. (See **Addendum #2** on file with these minutes.)

First, the motion defines a member of the Administration as any faculty member who also holds the administrative title of President, Provost, Associate or Vice Provost, Dean, or Associate Dean. **Prof. Heineman** explained that this category is distinct from faculty members with administrative responsibilities -- such as Department Heads, Program Directors or Center Directors, who are eligible to be elected. Second, the proposed changes here explicitly list all faculty members eligible to be elected to committees and make members of the Administration ineligible. The third change to the Faculty Handbook inserts language clarifying the roles of members of the Administration serving on governance committees. The proposed change adds that these members "are either explicitly identified as *ex officio* or may be appointed when the appointed member is explicitly identified as a representative of the Administration or of an Administrative Division or Office, according to the procedure described in this Faculty Handbook."

Prof. Heineman explained that the purpose of the motion is to clarify who may stand for election to faculty governance committees. While all faculty members are eligible to vote, the longstanding practice and policy of faculty governance is that members of the administration may hold appointed but not elected offices. With the introduction in the last decade of a number of new administrative positions, COG has now found it necessary to clarify the policy on election eligibility. **Prof. Heineman** explained that the institution relies on shared governance, and faculty governance relies on the collaboration between faculty and administration. This shared governance is facilitated through *ex-officio* and appointed positions held by members of the administration on many committees.

Prof. Heineman explained the rationale for these proposed changes: 1) the restriction of elected positions to non-administrative faculty ensures the broadest possible participation of faculty members who may have no other way of influencing or participating in decision making at WPI except through service on a committee; 2) the specified committee membership structures ensure appropriate participation and input from the Administration through *ex-officio* committee members and appointed representatives of the Administration; 3) The clarifications maintain our strong tradition of collaboration between faculty and administration in our faculty governance processes; 4) the motion acknowledges that holding formal roles in the Administration may affect the positions taken on faculty governance issues; 5) the motion relies on the common meanings of administrative titles in higher education.

Prof. Heineman explained that these changes make more transparent our policies about who may stand for election. In the past few years, the issue of election eligibility for faculty members of the Administration has arisen frequently in COG as the committee prepares election ballots.

Dean Gericke (UGS) proposed replacing the term "Administration" with the term "Management Council." His reason is that Associate Deans should be eligible for election: they teach and do what other faculty do and their role is very similar to that of Department Heads. He thought it was unfair and against the interests of the faculty to deprive them of the chance to vote for an Associate Dean. **Prof. Heineman** took note of the suggestion and asked Dean Gericke to send him a Management Council roster.

Dean McNeill (Eng.) disagreed that these changes encourage broad participation and pointed out that they eliminate the faculty's choice to elect a particular faculty member who happens to be an Associate Dean. He explained his opinion that the motion goes against the tradition of collaboration between faculty and administration and asked what administrators do that raises the worry about a conflict. **Prof. Heineman** replied that the concern with respect to broadness of participation is that by allowing people who already have administrative influence to take a seat that could be occupied by a non-administrative faculty member, we are narrowing participation.

Prof. Boudreau (HUA) added that we did not have Academic Deans or Academic Associate Deans 15 to 20 years ago, and it was clear in those days who was and who was not a member of the Administration. In addition, she pointed out that appointments to governance committees and search committees are made after elections, so the Administration (often in collaboration with faculty governance) is able to manage representation and ensure a presence of the Administration on our faculty governance committees.

<u>Committee on Governance (COG) and the Committee on Appointments and Promotions (COAP)</u>

Prof. Heineman (CS, COG Chair) explained that this motion is a collaboration between COG and COAP, presented today by COG. This motion provides guidelines for initiating searches for new department heads and for the appointments and terms of interim department heads. The goals are to ensure that department head transitions, whether anticipated or unanticipated, are handled smoothly and efficiently, and to discourage reliance on interim

department heads, since provisional leadership can delay seizing opportunities or recruiting new faculty. (See **Addendum #3** on file with these minutes.)

The motion calls for timely searches for a new department head when the department head's departure is known one year in advance. In those cases, the motion requires that "the search for the next Department Head will begin early in the next academic year," thus eliminating the need to appoint an interim Department Head. The motion includes guidelines governing the use of Interim Department Heads, who "should only be appointed due to unanticipated circumstances" and should be appointed to terms of not more than two consecutive years. The motion specifies that the search for the new department head will begin "no later than early the next academic year (following the year in which the Department Head vacancy first became known)."

Prof. Heineman noted that under both anticipated and unanticipated circumstances, faculty members within the department will be given an opportunity to provide their input to the Dean confidentially and/or anonymously, which the Dean will relay to the Provost, who makes the department head appointment.

Prof. Heineman explained the rationale for this motion: It recognizes the significant leadership role played by WPI department heads and the importance of departmental continuity expressed in the 5-year terms; and it ensures that Department Head transitions are handled with minimum disruption.

Prof. Shue (CS) appreciated the attentiveness to timelines for minimizing the need for interim heads and the quick action in bringing this motion to the faculty so soon after our discussion at last month's faculty meeting.

Prof. Ryder (BBT) wondered about the timing of a search if a department head who receives negative fourth-year review leading to nonrenewal. **Prof. Heineman** replied that COG discussed this issue and concluded that the search could begin in the fifth year.

Prof. Martin (MA) pointed out that, although the timeline becomes tight in the case that Prof. Ryder described (i.e. the Dean gets feedback in the fourth year, 15 months before the Department Head's term ends, and the timing is short to decide about whether to offer or accept a renewed appointment), he concluded that this difficulty is not, in most cases, sufficient reason to appoint an Interim Department Head unless the process is slowed down for other unanticipated reasons.

Prof. El-Korchi (CEAE), having served as an Interim Department Head for three years, shared his belief that these motions are important and will make for a healthier department management. Long-term provisional appointments, in his view, are disruptive of the department.

Prof. Richman encouraged faculty to share their comments with COG in time for COG to make revisions before the next Faculty Meeting.

<u>Committee on Financial and Administrative Policy (FAP), Committee on Governance (COG), and Fringe Benefits Committee (FBC)</u>

Prof. Dempski (CBC, FBC Chair) presented on behalf of FAP, FBC, and COAP. Prof. Dempski explained that FBC is currently composed of seven faculty members who invite five staff members to deliberate on important community issues. The proposed motion changes the composition of FBC and deliberations of the committee for more balanced representation and influence of staff in decisions that affect their benefits. (See **Addendum #4** on file with these minutes.)

Prof. Dempski reviewed the elements of this motion: 1) to aid in effective operations and equal representation, the motion decreases those participating in deliberations from 12 (i.e. 7 faculty members and 5 staff members) to ten, five drawn from the faculty and five from the staff; 2) staff appointments will be made by the Staff Council (with input from Talent and Inclusion, rather than by T&I) to proportionally represent exempt and non-exempt employees from across campus, supporting representative inclusion in deliberations over relevant benefits; 3) a Vice-Chair selected from the staff members and appointed by the Staff Council will ensure balanced leadership on matters of equal concern to faculty and staff; and 4) staggered terms for staff will enable continuity, sustained involvement, and knowledge accumulation in the interest of more informed and stable decision-making.

Prof. Richman, noting that this motion would change our Bylaws and thus will require two meetings, encouraged faculty to share their feedback. He expressed his excitement about having faculty governance collaborate with the

Staff Council formally for the first time. He introduced Mike Hamilton (IT), a member of the Staff Council and FBC, who shared his enthusiasm about having these changes formalized.

5. Committee Report

Committee on Governance (COG): Third Annual Report on WPI Faculty Populations and Clarification of Faculty Categories

Prof. Heineman (CS; Chair, COG), on behalf of the Committee on Governance, described Chapter One, Section Three (The Roles and General Balance of the Faculty in Carrying Out WPI's Mission), as well as Chapter Two, Section 2 (Balance of the Faculty at WPI: Faculty Populations) of the Faculty Handbook. Chapter Two, Section 2 describes the following institutional goals with respect to the full-time faculty: the faculty will consist of 70 percent tenured and tenure-track dual mission faculty and 30 percent teaching mission faculty; by fall 2023, 40 percent of the teaching mission faculty would be tenured or on the tenure-track and 60 percent would be off the tenure-track. According to the Faculty Handbook, each year COG is to present a report to the faculty on the various faculty populations. Both sections of the Handbook include the possibility of the community revisiting these goals to make changes based on shifting priorities. (See **Addendum #5** on file with these minutes.)

The tenured and tenure-track faculty (TTTF) consist of the dual mission Assistant, Associate, and Full Professors, as well as the Assistant, Associate, and Full Professors of Teaching. The secure teaching faculty (STF) are those on 1-3-3-5+ year contracts hired with the expectation of continuing academic responsibilities. The short-term (or critical need) teaching faculty are those on one-year contracts to fill temporary teaching needs. The important distinction between the STF and the short-term (critical need) teaching faculty is their contract status rather than their titles. Finally, we have adjunct teaching faculty who are paid on a course-by-course basis; research faculty (Assistant, Associate, and full Research Professors); visiting faculty from other institutions; and post-doctoral scholars.

Prof. Heineman then presented the data for the current academic year. For academic year 2023-2024, there are 280 dual mission TTT faculty (10 more than in 2021-22): 106 in Engineering (4 more than in 2021-22); 149 in Arts and Sciences (7 more than in 2021-22); 19 in Business (1 fewer than in 2021-22); and 6 in the Global School (no change from 2021-22). There are now 43 Professors of Teaching (28 more than 2021-22 due to the addition of two cohorts since the first); 9 in Engineering (6 more than in 2021-22); 24 in Arts and Sciences (16 more than in 2021-22); 0 in Business (no change from 2021-22); and 10 in the Global School (6 more than in 2021-22). There are 96 secured teaching faculty (24 fewer than in 2021-22 because of the conversion of two added cohorts to TTTs): 25 in Engineering (5 fewer than in 2021-22); 53 in Arts and Sciences (11 fewer than in 2021-22); 6 in Business (one more than in 2021-22); and 12 in the Global School (7 fewer than in 2021-22). So in all there are 323 (280 plus 43) TTTF (38 more than in 2021-22), 139 (43 plus 96) teaching mission faculty (4 more than in 2021-22), and 419 (280 plus 139) total full-time faculty (14 more than in 2021-22).

With reference to our institutional goals, currently 66.8 percent (280/419) of our faculty are dual mission TTTs, so it would take an additional 43 TTT dual mission faculty (323/462) to get to our goal of 70 percent. Furthermore, with 43 teaching faculty currently on the teaching track to tenure (including nine who were awarded tenure as of next year), that means that 30.9 percent (43/139) of our teaching faculty are now tenured or on tenure-track, so we would need to shift roughly 13 additional secured teaching faculty to the tenure track to reach our goal of 40 percent (43+13=56; 56/139= .40) of the teaching faculty on the tenure track.

Prof. Heineman clarified that by design in the faculty handbook, the focus of this report is on the distribution of faculty populations across the institution, rather than on the distribution of teaching loads within the various categories of faculty.

Finally, **Prof. Heineman** explained that additional slides not shown today (but available) provide more detailed population data broken down by department, as well additional 2023-24 data on visiting faculty and post doctoral scholars, and 2022-23 data for adjunct faculty.

Prof. Martin (MA) asked whether, because we have not reached the numerical goals in the Faculty Handbook, COG intends to revise the Handbook with new goals. **Prof. Heineman** responded that the purpose is simply to gauge where we stand with respect to the very targets in the Handbook. **Prof. Richman** added that in the past we have

had described goals much more vaguely, which made it very difficult to even agree on the terms used in any discussion about where the university stood.

Dean Sheller (GS) pointed out that the ratio of the total teaching faculty to the total faculty is higher than the target 30 percent. **Prof. Richman** agreed, explaining that the observation is consistent with the fact that the ratio of the dual mission faculty to total faculty is therefore lower than 70 percent.

Prof. Somasse (SSPS) asked how we came up with these numerical goals. **Prof. Heineman** pointed out that these goals about our faculty populations moved us away from focus on credits delivered and by whom. **Prof. Richman** added that the goals emerged from the three-year process in which we established the teaching path to tenure and improved the security of contracts for those teaching faculty members not on the tenure track. The 70/30 ratio of dual-mission to teaching mission faculty is not related to the teaching path to tenure, but rather it comes out of a consideration what kind of research/teaching balance do we want to strike as an institution. The answer to that question could not be captured by a ratio of TTTs to NTTs because the TTTs now include teaching faculty. In fact, at the time of those discussions and in the few years since, we have been fairly close to the 70/30 ratio. The 40/60 ratio of TTT teaching faculty to NTT teaching faculty, on the other hand, was arrived at entirely with consideration to the new teaching path to tenure. The decision to set the ratio specifically at 40/60 was the result of lengthy discussions concerning the balance between what the teaching faculty themselves, the administration, and the trustees all felt comfortable with.

Prof. Hansen (HUA) thought that there were too many benchmarks in the data presented, and that the numbers of those on tenure-track look much better than the way they are presented. We should celebrate what we have achieved, and have a discussion about what kind of institution we want to be. In his view, it would be valuable to know how the credit hours are delivered across different categories of faculty. He also did not see how 43 additional dual mission faculty members were needed to reach the 70/30 ratio. In response to the last point, **Prof. Heineman** explained that the denominator of the ratio also increases when more faculty are added.

Prof. Shue (CS) asked if we could ensure that the incoming provost candidates get this data. He added that this data, like data about our research funding, is very valuable for conversations about where we stand with respect to our institutional mission and whether we need more teaching faculty to deliver more credits or more dual-mission faculty to do more research. **Prof. Richman** pointed out that for many years COG presented detailed annual reports on credit delivery and that the data had had a divisive effect on the faculty. As a broad snapshot, **Provost Heinricher** indicated that last year the dual-mission tenure-track faculty delivered just over 50 percent of the credits at WPI, the teaching mission faculty members delivered about 40 percent of the of the credits, the adjunct faculty delivered the rest, and these numbers have been stable over the past few years.

Prof. Ryder (BBT) asked whether 43 dual mission were really needed to arrive at the 70/30 ratio.

Prof. Spanagel (HUA) recalled that when the goal had been set to increase our undergraduate student population to 5000, the Board also committed to increasing the number of dual-mission faculty to 300, which is 20 more than the 280 we currently have at WPI. In his view, to maintain a balance between teaching and research, a number between 20 and 43 additional dual-mission faculty seemed like a reasonable aspirational range.

Prof. El-Korchi (CEAE) hoped that, as we welcome a new provost, we would use the data presented here to continue a broad campus-wide discussion about the academic culture we would like to foster.

6. New Business

There was no new business.

7. Provost's Report

Provost Heinricher reiterated Dean Snoddy's reminder to RSVP for graduation events. He is looking forward to the faculty and student convocations. He noted that the crossing of Earl Bridge is an important tradition and urged the faculty to participate. He echoed Prof. Richman's gratitude to those who stood for election to COG, CTAF, and COAP, and he repeated COG's encouragement to appear on the ballot for the other committees. Provost Heinricher

reminded everyone that we are entering awards season and have lots of events on campus that are part of our culture.

8. Closing Announcements

Prof. Richman emphasized the important business still to be done at the May 7 faculty meeting, and he encouraged all faculty members to attend.

9. Adjournment

Meeting was adjourned at 4:47pm by **Prof. Richman**.

Respectfully submitted,

Mark Richman
Secretary of the Faculty

Addenda on file with these minutes:

Addendum #1 - CITP Motion to revise the Mailing List Policy - Minutes - April 11 2024
Addendum #2 - COG Motion on Election Eligibility - Minutes - April 11 2024
Addendum #3 - COG Motion on Interim Dept Heads - Minutes - April 11 2024
Addendum #4 - FAP-FBC-COG Motion to Modify FBC Membership - Minutes - April 11 2024
Addendum #5 - Third Annual COG Report on Faculty Populations AY 2023-24 - Minutes - Apr 11 2024

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to approve the May 2024 undergraduate student graduation list

Motion: The Office of the Registrar reports that the following candidates have either completed all the requirements for the degree designated in the department or program indicated or are expected to complete their degree requirements before May 10, 2024. They therefore are or will be eligible to receive that degree, and on behalf of the Committee on Academic Operations, I move that – pending final verification by the Registrar that all those on the list have in fact completed their degree requirements – they be approved for May 10, 2024 graduation.

Bachelor of Arts

Environmental and Sustainability Studies:

Cortina Barbieri
Double Major
Amanda Borden
Double Major
Eugena Choi
Double Major
Minor: International and Global Studies
Hannah George
Innovation for Social Change Concentration
Double Major
Abigail Pulling
Double Major
Merel Sutherland
Double Major
Zoe Swartley
Double Major
Lucien Wallace
Double Major

Interactive Media and Game Development:

Zachary Adams
Technical Art Concentration
Minor: Computer Science
Jason Asidi
Griffin Bowers
Minor: Business
Ethan Chau
Writing Concentration
Double Major
Jeff Chen
Minor: Computer Science
Renee Cullman
Minor: Architectural Engineering
Conor Dolan
Alistair Gilmour
Jessica Liano
Minor: Computer Science
Carolyn Meyer
Schuyler Rae Pritchard
Minor: Computer Science
Kerri Thornton
Madelyn Veccia
Design Concentration
Joseph Volpato
Lauren Waddick
Visual Art Concentration
Minor: Computer Science
Charles West
Design Concentration
Minor: Computer Science

Bachelor of Science

Actuarial Mathematics:
Abigail Barksdale
Minor: Data Science
Gianni Camileo
Jack Cascone
Minor: Data Science
Allyson Floria
Allison McMorrow
Minor: Data Science
Ngoc Pham

Aerospace Engineering:
Alex Ballentine
Minor: Mathematics
Chris Baxter
Minor: Astrophysics
Cailin Borovicka
Minor: Business
Gregoire Brougher
Minor: Computer Science
Nathan Brumble
Joseph Calomo
Andrew Carlton
Ryan Chesanek
Benjamin Cobb
Quentin Collins
Minor: Astrophysics
Lexi Dahlquist
Minor: Astrophysics
Shannon Daly
Michael Daton
Robert Doyle
Graham Driscoll-Carignan
Abigail Duval
Minor: German
Jacob Ewen
Isaac Garry
Mike Gouveia
Roman Gowie
Minor: Astrophysics
Spencer Granlund
Corbin Grubb
Minor: Robotics Engineering
Jarrett Gulden
Finnian Hamblett
Minor: Physics
Elizabeth Healy
Minor: Spanish
Naoki Heginbotham
Minor: Computer Science
Colleen Henderson
Minor: Physics
Roman Henry
Alice Kelly
Minor: Astrophysics
Melissa Kelly
Minor: Robotics Engineering
Peter Korfuzi
Joseph Kuchenmeister
Cole Lederman
Jake Letourneau
George Love
Claire Matthews
Minor: International and Global Studies
Matthew McMahon
Elias Monzayet
Minor: International and Global Studies
Bridget Muturi
Marina Nelson
Jackson Neu
Sean Nuzio
Minor: Astrophysics
Cyril Ogbebor
Adam Osgood
Cristina Perez
Liam Piper
Nathaniel Polus
Viren Punjabi
Minor: Electrical and Computer Engineering
John Radzanowski
Charles Ritchie
Evan Russell
Troy Santopadre
Richard Shaw
Minor: Economics
Ellie Sherman
Douglas Shirakura
Minor: Business
Bryan Silva

Aerospace Engineering cont.:
Janelly Torres
Benjamin Twombly
Regina Valencia
Minor: Creative Writing
Erika Varady
Ariel Velasquez
Samuel Vinson
Zachary Winston

Applied Physics:
Natalie Frey
Xavier Morales
Charlie Tribble

Architectural Engineering:
Jesse Ames
Anna Bauerle
Morgan Collins
Vivienne Evans
Minor: Sustainability Engineering
William Fallon
Franklin Ford
Joseph Hurley
Seton King
Ethan Lockhart
Joseph McNeill
Jailyn Medeiros
Natanel Pinkhasov
Minor: Aerospace Engineering
Kyle Shriberg
Dreivone Townsend
Christina Tran
Megan Tupaj
Double Major
Gianna Viele

Biochemistry:
Charlotte Adams
Patrick Bailey
Minor: Philosophy and Religion
Meghan Barry
Juliet Bolduc
Madison Brown
Kallie Case
Megan Caten
Diana DiTullio
Kylie Doehring
Double Major
Lindsay Hoey
Rafaela Kanli
Lily Lancellotti
Minor: Psychological Science
Sophie Loree
Liliana MacDonald
Jake McDonough
Bailey Norris
Minor: Psychology
Eva Plankey
Nicholas Sorel
Minor: Theatre
Ren Vitellaro
Double Major
Jacob Vosburg
Morgan Whitney

Bioinformatics and Computational Biology:
Olivia Deckers
Minor: Data Science
Gabriella Guzman-Jerry
Minor: Global Public Health
Vivek Kandasamy
Minor: Data Science
Carter Nakagawa

Biology and Biotechnology:
Lauren Abraham
Maryam Al Hakeem
Jan Anthony
Minor: Business
Sarah Aspinwall
Kaleigh Caserta
Vanessa Cenkollari
Daisy Connors
Minor: Global Public Health
Katherine Corbin
Minor: Environmental and Sustainability Studies
Madelaine Freitas
Holly Galvin

Biology and Biotechnology cont.:

Olivia Garrity
Minor: Spanish
Hannah Gilmore
Minor: Psychology
Rachel Grandmaison
Caitlin Guilfoyle
Minor: History
Kelly Heffernan
Double Major
Mira Kirschner
Psychobiology Concentration
Double Major
Stephanie Lee
Samuel Levitan
Minor: Global Public Health
Alana Lue Chee Lip
Dylan Mackisey
Grace McCarthy
Minor: Bioinformatics and Computational Biology
Taylor Jane McGinty
Minor: Global Public Health
Connor McKaig
Minor: Biochemistry
William Miller
Minor: Biochemistry
Ciara Moroney
Clare Nargi
Jackie Nicoletti
Josephine Patten
Minor: Psychological Science
Alexandra Poulhazan
Minor: Writing and Rhetoric
Katie Quinn-Cyr
Psychobiology Concentration
Double Major
Mikayla Raffin
Stephanie Reis
Kyra Robinson
Minor: Chemistry
Nora Shanks
Grace Solod
Minor: Global Public Health
Zoe Swartley
Double Major
Ren Vitellaro
Double Major
Allison Walker
Hayley Wigren
Minor: Bioinformatics and Computational Biology
Alexis Wood
Double Major

Biomedical Engineering:

Ali Attaa
Double Major
Lauren Averka
Double Major
Amirthavarshini Babu
Minor: Computer Science
Emma Bass
Codey Battista
Joseph Beane
Minor: Spanish
Chase Beausoleil
Double Major
Helga Becka
Isabelle Benson-Clarke
Riley Bent
Kenza Bezzat
Avinash Bissoondial
Roman Bolshakov
Jack Brazer
Sydney Breen
Benjamin Breslov
Double Major
Kellie Bushe
Double Major
Kerry Bushway
Minor: Mechanical Engineering
Gabriel Cason
Samantha Cocchiaro
Francis Coghlan
Kayla Condon
Anna Cox
Cameron Crane
Double Major
Louis Desy
Leithsa Dimanche

Biomedical Engineering cont.:

Madison Donahue
Minor: Chemistry
James Doucette
Lillian Dupuis
Minor: Spanish
Jacob Elliott
Minor: Business
Stuart Elmhurst
Lexis Emma
Minor: Mechanical Engineering
Mikaela Enax
Jazmyn Ewing
Minor: Psychology
Guinevere Ferreira
Double Major
Gabriela Ferullo
Eleanor Finberg
Morgan Foltz
Minor: Materials
Minor: Biology
Tiffany Foote
Double Major
Martin Fortou
Abby Gallagher
Daniela Galvan Sanchez
Connor Gaudette
Double Major
Achilles Gikas
Double Major
Nishan Grandhi
Alexis Graziano
Brenna Hadad
Livia Hernon
Mikkel Hersum
Abigail Holmes
Daniel Holtz
Double Major
Aidan Kaufman
Tera Keang
Anna Kelly
Minor: Chemistry
Hunter Lassard
Timothy Lee
Double Major
William Leland
Grace Liu
Stephanie Low
Double Major
Minor: Chemistry
Nicolas Loycano
Molly Mahoney
Minor: Chinese Studies
Caroline Major
Theatre Concentration
Double Major
Isabella Mastriani
Elizabeth Matticoli
Anna McCusker
Jacob McDonald
Naisargi Mehta
Double Major
Antone Mello
Jack Melvin
Jaya Mills
Minor: Biology
Minor: Materials
Jennifer Mills
Alex Moreira
Minor: Mechanical Engineering
Alyssa Morgan
Double Major
Sophia Mularoni
Chris Nguyen
Sarah Ossing
Zoe Pace
Sarah Percifull
Aidan Pereira
Abbigail Poland
Minor: Mechanical Engineering
Jules Prisco
Minor: Electrical and Computer Engineering
Nina Quattromani
Gautham Rajeshkumar
Gabriella Rios
Theresa Rosato
Minor: Biology
Jack Rothenberg
Double Major
Luke Rudolph
Double Major

Biomedical Engineering cont.:
Sydney Russell
Mylla Santana
Double Major
Donovan Sevilla
Minor: Business
Isabella Sheeran
Livia Skende
Sydney Smith
Emily Strojny
Priyankha Sunil
Sequoia Truong
Double Major
Samantha Turner
Minor: Electrical and Computer Engineering
Roshini Uthayakumar
Minor: Bioinformatics and Computational Biology
Nicholas Uy
Minor: Psychology
Spencer Whitford
Cassidy Williams
Biomechanical Concentration
Double Major
Ina Wong
Taylor Wood
Minor: Materials
Armela Xhindole
Cara Yorina
Rebecca Young
Double Major
Haoran Zhang
Minor: Robotics Engineering
Angus Zuwallack

Business:
Evan Bettencourt
Business Analytics Concentration
Double Major
Joel Brunzell
Innovation for Social Change Concentration
Hannah George
Innovation for Social Change Concentration
Double Major
Walter Giardina
General Business Concentration
Zach Newberg
Financial Technology Concentration
Katelyn Tropeano
Financial Technology Concentration
Eric Wang
General Business Concentration

Chemical Engineering:
Lucas Bazydola
Emily Brindisi
Materials Concentration
Kathleen Buek
Rachel Cabral
Warren Callen
Cameron Carlin
Kayla Carpenter
Nicholas Culkin
Abigail Deichert
Thomas Dell'Aera
Nathan Demers
Cameron DiMeglio
Julia Dowd
Minor: Business
Samantha Dubord
Environmental Concentration
Double Major
Max Elwell
Mae Felkner
Ethan Fox
RJ Franzen
Tyler Gambon
Energy Concentration
Gabriel Garbes
Minor: History
Alexander Greally
Leah Harnisch-Weidauer
Environmental Concentration
Double Major

Chemical Engineering cont.:

Lili Hellerman
Environmental Concentration
Double Major
Chase Herberich
Environmental Concentration
Double Major
Eric Kasischke
Skyler Kauffman
Minor: Chemistry
Jacob Kayser
Evelyn Kellum
Patrick King
Gavin Maloney
Zach Manfredi
Jonathan Martin
Minor: Music
Terrence McFarland
Environmental Concentration
Double Major
Patrick McKenna
Paige Mesick
Alex Mosley
Double Major
Alec Parish
Environmental Concentration
Double Major
Emily Pimentel
Biomedical Concentration
Double Major
Joshua Roberts
Steven Robinson
Jonathan Santos
Daniel Shea
Violet Smiarowski
Biological Concentration
Jada Smith
Biological Concentration
Kate Stoncius
Minor: Materials
Oamfah Suwannapong
Caitlyn Swartz
Double Major
Adrianna Tagayun
Benjamin Traverso
Energy Concentration
Andrew Troup
Maya Vartabedian
Joelis Velez Diaz
Environmental Concentration
Double Major
Minor: Materials
Hannah Wolfgang
Biological Concentration
Jia Yazon
Double Major
Deah Zajmi
Biological Concentration
Minor: Philosophy and Religion

Chemistry:

Elizabeth Dahlberg
David MacLeod
Matthew Resmini
Caitlyn Swartz
Double Major
Oliver Zaba
Minor: Materials

Civil Engineering:

Deidra Anderson
Mario Barberio
Luke Barckholtz
Nicholas Battaglino
Jocelyn Bourgoin
Samantha Calamari
Donald Crowley
Luna Daury
Environmental Concentration
Double Major
Jacob DelMonte
Samuel Dickens
Michaela Dos Santos
Clara Dublin
Alexi Echevarria
Lenny Fils-Aime
Braeden Fruchtman
Bridget Gillis
Madeline Goggin
Minor: Sustainability Engineering
Minor: Media Arts
Robert Gyurcsan

Civil Engineering cont.:

Edward Jacoby, V
Louis Lavenda
Ryan Malaquias
Nicholas Manz
Michael McLoughlin
Margaret Paratore
Michael Peck
Frankie Polito
Abigail Pulling
Double Major
Ravyn Rapley
Nathan Raymond
Aaron Swann
Brandon Taranto
Adam Tedesco
Vivian Vacharakupt
Emmanuel Vargas

Computer Science:

Jacob Adams
Jacob Adamsky
Matthew Adragna
Austin Aguirre
Michael Akstin
Julia Albrecht
Minor: Interactive Media and Game Development
Arthur Ames
Double Major
Talia Andrews
Alpay Ariyak
Will Babincsak
Benjamin Bagley
Minor: Data Science
Ronit Banerjee
Double Major
Cortina Barbieri
Double Major
Joselin Barbosa
Mohamed Barry
Vagmi Bhagavathula
Double Major
Riley Blair
Double Major
Abigail Boafo
Double Major
Andrei Bornstein
Nicholas Borrello
Alessandro Brianti
Karl Brzoska
Nicole Burgess
Kathryn Butziger
Jacob Byrnes
Minor: Data Science
Jayson Caissie
Alasdair Campbell
Minor: Data Science
James Cao
Ed Carrotta
Double Major
Minor: Media Arts
Ethan Catania
Alvin Chen
Minor: Data Science
Valerie Childers
Robert Chiocchio
Minor: Robotics Engineering
Minor: International and Global Studies
Jacob Chlebowski
Newell Clark
Joe Colley
Double Major
Timothy Connors
Theo Coppola
Camilo Cordoba Escobar
Amber Cronin
Double Major
Shiming De
Double Major
Brian DeFlaminio
Minor: Management Information Systems
Cooper Dean
Double Major
Minor: Interactive Media and Game Development
Sameer Desai
Nelson Diaz
Joseph Dobbelaar
Tate Donnelly
Double Major

Computer Science cont.:

William Doyle
Kaley Du
Will Dufault
Minor: Data Science
Craig Dunn
Randy Dyer
Amitai Erfanian
Robert Eskridge
Adeline Evans
Tyler Evans
Stephen Fanning
Double Major
Jose Fabrizio Filizzola Ortiz
Luke Foley
Minor: Data Science
Nicholas Frangie
Double Major
Stevie Frisch
Minor: Business
Colin Fyock
Minor: German
Marek Garbaczonek
Double Major
Luke Gardone
Michael Gatti
Benjamin Gelinas
Double Major
Paul Godinez
Noah Goodman
Cameron Goodrich
Deepti Gosukonda
Minor: Data Science
Ian Grzembski
Cyber Security Concentration
Kristine Guan
Minor: Data Science
Liam Hall
Quentin Hall
Jack Hanlon
Andrew Hariyanto
Double Major
Nick Heineman
Eli Hoffberg
Minor: Interactive Media and Game Development
Samara Holmes
Double Major
Abby Hoschouer
Minor: Electrical and Computer Engineering
Jonathan Hsu
Joanna Hu
Minor: Data Science
Minor: Mechanical Engineering
Randy Huang
Minor: Data Science
William Huang
Zaq Humphrey
Dylan Hunt
Yasar Idikut
Double Major
Neil Kale
Double Major
Minor: Robotics Engineering
Samuel Karkache
Double Major
Andrew Kerekon
Matthew Kiszla
Minor: Data Science
Timothy Klein
Double Major
Thomas Kneeland
Music Concentration
Double Major
Charles Kneissl-Williams
Jatin Kohli
Double Major
Nadav Konstantine
Minor: Financial Technology
Ryan Kornitsky
Aru Koshkarova
Double Major
Ben Kresge
Minor: Bioinformatics and Computational Biology
Darren Kwee
Minor: Music
Matthew Lacadie
Jared Lasselle
Yu-Chi Liang

Computer Science cont.:

Bright Lin
Double Major
Axel Luca
Minor: Mathematics
Bryce Lukens
Minor: Bioinformatics and Computational Biology
Jackson Lundberg
Minor: Business
Brandon Luong
Jack Lynch
Alexander MacDonald
Aidan MacNevin
Joshua Malcarne
Kavya Mani
Nicholas Markou
Matthew McAlarney
Owen McGinley
Matthew McGourty
Michael McInerney
Andrew McKeen
Double Major
Conner McKevitt
Double Major
Ali McNicholas
Colin Mettler
Jair Meza
John Mezzo
Mikaela Milch
Double Major
Minor: Business
Chase Miller
Jose Morales
Serena Mower
Minor: Creative Writing
Ethan Moynihan
Minor: Robotics Engineering
Madeline Mueting
Andres Eduardo Negron Parra
Minor: Financial Technology
Trevor Ng
Double Major
Aaron Nguyen
Andrew Nguyen
Minor: Psychology
Minor: Interactive Media and Game Development
Dylan Nguyen
Double Major
Nhi Nguyen
Double Major
Qui Nguyen
Bernhard Nordemann
Minor: Electrical and Computer Engineering
Alyssa Ogi
Robbie Oleynick
Double Major
Minor: Music
Minor: Mathematics
Daniel Onyema
Jinjia Ou
Cole Ouellette
Cyber Security Concentration
Evans Owusu
Isabella Pabon
Adina Palayoor
Double Major
Kaelin Panneton
Minor: Interactive Media and Game Development
Cole Parks
Double Major
Harsh Patel
Jai Patel
Connor Peavey
Double Major
Grant Perkins
Jolene Pern
Minor: Data Science
Dylan Phillips
Robert Philpot
Alex Pietrick
Double Major
Minor: Creative Writing
Nelson Pires
Double Major
Mira Plante

Computer Science cont.:

Cambria Pomeranz
Double Major
Juliana Porto
Caitlyn Puiia
Cyber Security Concentration
Ryan Rabbitt
Minor: Interactive Media and Game Development
Owen Radcliffe
Olivia Raisbeck
Double Major
Engjell Ramadani
Tucker Raymond
Minor: Data Science
Austin Rebello
Jacob Reiss
Vivian Reno
Mark Renzi
Cristobal Rincon Rogers
Double Major
Kody Robinson
Minor: Financial Technology
Kseniia Romanova
Minor: Interactive Media and Game Development
David Rosenstein
Minor: Data Science
Apollinaris Rowe
Joey Rozman
Harrison Rubin
William Ryan
Rusen Sabaz
Arnav Sacheti
Double Major
Nathaniel Sadlier
Minor: Interactive Media and Game Development
Patrick Salisbury
Andrew Salls
Double Major
Justin Santiago Wonoski
Caleb Scopetski
Keenan Segenchuk
Dylan Shanes
Minor: Data Science
Tristan Sharich
Nathan Shemesh
Oliver Shulman
Sophia Silkaitis
Jakob Simmons
Duncan Soiffer
Double Major
Andrew Sosa
Alexander Sun
Double Major
Sriram Sundararajan
Double Major
Minor: Creative Writing
Caleb Talley
Harrison Taylor
Ethan Thompson
Bryon Tom
Double Major
Jenna Tripoli
Minor: Interactive Media and Game Development
Dov Ushman
Minor: Financial Technology
~~Natasha Ussrey~~
Double Major
Brandon Vuong
Lehong Wang
Double Major
Aidan Wech
Cyber Security Concentration
Jordan Wecler
Minor: Data Science
Justin Weintraub
Connor West
Cyber Security Concentration
Minor: Data Science
Ilana Whittaker
Minor: Music
Mike Wilkinson
Minor: Electrical and Computer Engineering
Casey Wohlers
Sharon Wu
Taya Yakovenko
Double Major
James Yi

Computer Science cont.:
Yifu Yuan
Double Major
Grace Yue
Minor: Writing and Rhetoric
Minor: Data Science
Cather Zhang
Edison Zhang
Eric Zhou
Annie Zimmerman

Data Science:
Dante Amicarella
Aukkawut Ammartayakun
Maxime Anderson
Minor: Management Information Systems
Ronit Banerjee
Double Major
Vagmi Bhagavathula
Double Major
Katie Bowles
Charlotte Carter
Minor: Chinese Studies
Sasha Daraskevich
Minor: Management Information Systems
Brock Dubey
Minor: Management Information Systems
Allison Escott
Mattheus Faria
Minor: Business
Joseph Fox
Kendall Haddigan
Matt Haley
Minor: Management Information Systems
Janette Jerusal
Jennifer Kimball
Aru Koshkarova
Double Major
Jack Lafond
Nicholas Latsis
Kristin Lavoie
Minor: Management Information Systems
Maya Liao
Minor: Computer Science
Duong Luong
Minor: Business
Shivali Mani
Minor: Computer Science
Madelyn Marcotte
Mikaela Milch
Double Major
Minor: Business
Justine Moy
Dylan Olmsted
Minor: Computer Science
Adina Palayoor
Double Major
Sydney Peno
Federico Perez
Mason Perham
Sandra Phan
Double Major
Alex Pietrick
Double Major
Minor: Creative Writing
Mackenzie Pryor
Olivia Raisbeck
Double Major
Ethan Reed
Minor: Computer Science
Matthew Reynolds
Maceo Richards
Ethan Rudometkin
Eric Schuman
Megan Sin
Bishoy Soliman Hanna
Matthew Suyer
Daniel Thu
~~Natasha Ussrey~~
Double Major
Ethan Vaz Falcao
Double Major
Justin Vo
Double Major
Aria Yan
Minor: Computer Science

Economic Science:
Alexandria Sheehan
Minor: Data Science
Minor: Business

Electrical and Computer Engineering:

Ryan Antes
Minor: Data Science
Julia Antocci
Minor: Robotics Engineering
Evan Apinis
Ali Attaa
Double Major
Christina Aube
Double Major
Hussain Bhatti
Abigail Brachtl
Genna Brown
Minor: Computer Science
Vincenza Burdulis
Jack Charpentier
Sarah Chen
Aisling Corcoran
Ryan Cote
Nick Coviello
Maria Cox
Amber Cronin
Double Major
Christopher Danti
Ilyssa Delizo
John Demedeiros
Tara Desrochers
Thai Duc Doan
Double Major
Benjamin Dodge
Edison Doko
Trevor Drane
Minor: Computer Science
Wassim Faker
Minor: Mathematics
Alberto Flores
Matthew Frey
Casey Frommer
Mark Gagliardi
Double Major
Kleo Golemi
Zoe Goodman
Andrew Gray
Jacob Hand
Minor: Computer Science
Luke Harrington
Minor: Entrepreneurship
QiHan He
Abigail Hodges
Joshua Hollyer
Yashas Honnavalli
Michael Iberger
Yangyang Jin
Max Kanefsky
Minor: Mathematics
Isa Kaplan
Samuel Karkache
Double Major
Olivia Kendzulak
Minor: Data Science
Tai Le
Efthymios Marios Loukedes
Matthew Madamba
Luciano Malavasi
Double Major
Andrew Malnicof
Coco Mao
Trey Marcantonio
Ryan McSweeney
Nikola Meco
Naisargi Mehta
Double Major
Joan Miho
Lorenzo Mira
Andrew Neamtu
Jacob Nguyen
Minor: Business
Minor: Data Science
Pari Nguyen
Minor: Computer Science
Brendan O'Mullan
Minor: Mechanical Engineering
Robbie Oleynick
Double Major
Minor: Music
Minor: Mathematics
Krish Patel
Minor: Computer Science
Olivia Peterson
Jordan Pina
Deborah Queiroz Diniz

Electrical and Computer Engineering cont.:

Nathaniel Reppucci
Dominic Ridolfi
Elinor Ross
Mason Roth
Minor: Mechanical Engineering
Owen Rouse
Minor: Robotics Engineering
Arnav Sacheti
Double Major
Dimitri Saliba
Double Major
Brooke Schoen
Jacob Schools
Ethan Shaw
Kathlyn Sirowich
Minor: Computer Science
Rachel Smith
Dexuan Tang
Allan Villatoro
Timothy Walsh
Hao Wang
Meng Wang
Benjamin Wheet
Elisabeth Whittemore
Tyler Wong

Environmental Engineering:

Kendall Begin
Carley Burns
Eugena Choi
Double Major
Minor: International and Global Studies
Isabella Clowes
Minor: Environmental and Sustainability Studies
Bryce Curtin
Duncan D'Olimpio
Christian Davis
Lauren Eppinger
Double Major
Minor: International and Global Studies
Neilie Fromhein
Kayleigh George
Minor: Sustainability Engineering
Chloe Harrison
Ricky Healey
Joseph Horowitz
Alex Mosley
Double Major
Noelle Noons
Minor: Theatre
Joseph Peregrim
Minor: Mechanical Engineering
Minor: Sustainability Engineering
Minor: History
Jack Perriello
Bhargavi Ramesh
Minor: Mechanical Engineering
Liam Thomson
Kaleigh Walsh

Humanities and Arts:

Lauren Eppinger
Double Major
Minor: International and Global Studies
Thomas Kneeland
Music Concentration
Double Major
Caroline Major
Theatre Concentration
Double Major

Industrial Engineering:

Matthew Adam
Double Major
Minor: Management Information Systems
Phillip Cass
Double Major
Benjamin Chaves
Leonardo Coelho
Miguel Duran Guardia
Ben Erwin
Haley Gilbert
Kirsten Harrod
Tyler Jordan
Minor: Business
Raman Kaushik
Minor: Computer Science
Elijah Kennedy

Industrial Engineering cont.:
Josh Kleiman
Double Major
Conor McGonigle
Shannon Reno
Minor: Environmental and Sustainability Studies
Henry Sniezek
Sarah Spencer
Minor: Data Science
Maryka Tousignant
Christian Varela
Francisco Yanes Gorbea
Minor: Business
Adrianna Yuen

Interactive Media and Game Development - Technology:
Ed Carrotta
Double Major
Minor: Media Arts
Joe Colley
Double Major
Shiming De
Double Major
Tate Donnelly
Double Major
Nicholas Frangie
Double Major
Marek Garbaczonek
Double Major
Benjamin Gelinas
Double Major
Andrew Hariyanto
Double Major
Bright Lin
Double Major
Trevor Ng
Double Major
Connor Peavey
Double Major
Nelson Pires
Double Major
Sriram Sundararajan
Double Major
Minor: Creative Writing

Interdisciplinary:
Neha Kuchipudi
James Obermaier
Minor: Music
Allison Rozear

International and Global Studies:
James Ralph
Double Major

Management Engineering:
Ryan Biberon
Operations Management Concentration
Minor: Industrial Engineering
Nikolaos Diakides
Civil Engineering Concentration
Nicolas Gronda
Civil Engineering Concentration
Megan Haley
Civil Engineering Concentration
Andrew Lufkin
Operations Management Concentration
Minor: Entrepreneurship
Stephen MacDonald
Operations Management Concentration
Ryan Martin
Mechanical Engineering Concentration
Giancarlo Orlandi
Mechanical Engineering Concentration
Drew Plunkett
Mechanical Engineering Concentration
Minor: Financial Technology
Jennifer Russo
Biomedical Engineering Concentration

Management Information Systems:
Brian Fox
Caroline McLaughlin
Double Major
Dang Nguyen
Minor: Data Science
Sandra Phan
Double Major
Justin Vo
Double Major

Mathematical Sciences:

Evan Bettencourt
Business Analytics Concentration
Double Major
Kai Chhoeuk
Scarlett Clarke
Minor: Physics
Cooper Dean
Double Major
Minor: Interactive Media and Game Development
Sycamore Herlihy
Caitlin Ho
Minor: Data Science
Neil Kale
Double Major
Minor: Robotics Engineering
Kaycie Lam
Minor: Business
Kyle Lusignan
Minor: Data Science
Cameron Norton
Noah Pins
Minor: Data Science
Zachary Pitts
Andrew Salls
Double Major
Duncan Soiffer
Double Major
Natalie Tierney
Minor: Data Science
Minor: Computer Science
Megan Tupaj
Double Major
Ethan Vaz Falcao
Double Major
Taya Yakovenko
Double Major

Mechanical Engineering:

Cory Abraham
Jacob Abrogar
Mechanical Design Concentration
Matthew Adam
Double Major
Minor: Management Information Systems
Jonathan Adams
Mohamed Aljundi
Andrew Amkreutz
Tristan Andrew
Jack Arabian
Minor: Computer Science
Maria Aranda Ramirez
Daniel Barmakian
Imogen Barnes
Minor: Music
Josh Barney
Heath Bastow
Minor: Electrical and Computer Engineering
Jacob Bendick
Minor: Business
Terrence Benedict
Matt Boisvert
Michael Bonito
Minor: Philosophy and Religion
Amanda Borden
Double Major
Michael Bragg
Minor: Business
Harris Brancazio
Benjamin Breslov
Double Major
DJ Brooks
Alexander Brown
Gabriel Brown
Phil Brush
Double Major
Liam Bry
Douglas Cain
Paige Campagna
Dylan Campbell
Mechanical Design Concentration
Hunter Carey
Zeb Carty
Minor: Computer Science
Phillip Cass
Double Major
Jack Cassidy
Minor: Business
Henrique Checcucci Bahia dos Santos
Kaiwen Chen

Mechanical Engineering cont.:

Dhruv Chheda
Mechanical Design Concentration
Minor: Robotics Engineering
Luka Christianson
Abigail Clemence
Jimmy Clemente
Minor: Fire Protection Engineering
Brett Cohen
Minor: Business
Chloe Connolly
Madeline Connor
Minor: Business
David Costa
Rion Crear
Magnus Crooke
Patrick Daly
Justin DeBeaucourt
Minor: Manufacturing Engineering
Li DeWitt
Biomechanical Concentration
Minor: Materials
Gabriela DiMauro
Eliza Dion
Nate Dixon
Double Major
Tucker Doolan
Connor Dowgielewicz
Minor: Business
Matthew Duncan
Elliot Dunham
Joel Eckstrom
Flint Eller
Edward Enyedy
Double Major
Gabriel Espinosa
Minor: Astrophysics
Minor: Sustainability Engineering
Minor: Robotics Engineering
Trevor Faber
Aedan Fahy
Lauren Faulkner
Minor: Fire Protection Engineering
Jessica Feeney
Belkys Felix Nova
Peter Fernholz
Minor: Business
Guinevere Ferreira
Double Major
Edward Flanagan
Mechanical Design Concentration
Matthew Folenta
Sean Foody
Taylor Frederick
Sara Frunzi
Minor: Robotics Engineering
Matthew Gadziala
David Gedraitis
Achilles Gikas
Double Major
Emma Gilroy
Adam Giordani
Natalie Gonthier
Elias Gonzalez
Shivaani Gopal
Minor: Data Science
Ryan Gottwald
Samay Govani
Double Major
Samuel Griffiths
William Gunn
Minor: Business
Shivank Gupta
Double Major
Isabel Hallal
Minor: Spanish
Michael Haroutunian
Patrick Healey
Liam Hemmerling
Noah Herzig
Daniel Holtz
Double Major
Liam Hoyle
Minor: Physics
Tereza Hruba
Minor: Business
Kelli Huang
Mechanical Design Concentration
Nikita Igoshin
Jacob Isaac
Sophia Islam

Mechanical Engineering cont.:

Megan Jacene
Nicholas Johannessen
Double Major
Minor: Manufacturing Engineering
Minor: Computer Science
Alden Johnson
Mechanical Design Concentration
Minor: Gender, Sexuality and Women's Studies
Wirt Jones
Julia Kay
Minor: Sustainability Engineering
Bryce Kennedy
Mechanical Design Concentration
Samuel Kierstead
Mechanical Design Concentration
Alexa Klamka
Josh Kleiman
Double Major
Alessia Kodhimaj
Georgios Komninos
Minor: Business
Landen Kovens
Isaac Krieger
Minor: Computer Science
Jared Krueger
Isabelle Lachaux
Double Major
Nikki Lam
Samuel Lambert
Adelan Latli
Isaac Lau
Kiana-Karla Layam
Jose Arturo Leal Figueredo
Manufacturing Concentration
Tia Lee
Minor: Computer Science
Timothy Lee
Double Major
Chenhao Li
~~Sophia Lindsay~~
Nathan Lipka
Stephanie Low
Double Major
Minor: Chemistry
Keira Lynch
Mechanical Design Concentration
Ian MacInerney
Double Major
Avery Macomber
Biomechanical Concentration
Michael Magalhaes
John Mansour
William Mara
Alexander Masiero
Andrew McCammon
Minor: Robotics Engineering
Minor: Manufacturing Engineering
Minor: Media Arts
Dillon McDermott
Minor: Fire Protection Engineering
Sean Merone
Keith Mesecher
Minor: Music
Minor: Electrical and Computer Engineering
William Michels
Kacie Miller
Shaniqua Miller
Darcy Milligan
Shawn Mills
Biomechanical Concentration
Eric Montiverdi
Erin Murphey
Mechanical Design Concentration
Christopher Nerkowski
Mechanical Design Concentration
Amy Ngo
Danny Ngo
Double Major
Isaac Noble
Emma Nollman
Minor: Psychology
Jack O'Neill
Maxwell Onffroy
Minor: Computer Science
Daniel Ouellette
Calvin Page
Double Major
Jacob Palosky
Minor: International and Global Studies

Mechanical Engineering cont.:

Gabriel Pardo Cota
Jack Parker
Minor: Business
Devin Patel
Andrew Peyton
Minor: Computer Science
Thomas Piccione
Ryan Powers
Minor: Business
Praniva Pradhan
Shannen Preble
Minor: Chemistry
Joseph Puia
Mechanical Design Concentration
Avery Purtell
Kellen Queeney
Cole Rabe
Minor: Electrical and Computer Engineering
Gray Rahm
James Ralph
Double Major
Morgan Raposa
Luke Regan
Kelsey Reno
Marc Rich
Minor: Manufacturing Engineering
Timothy Rinaldi
Double Major
Samantha Rosenberg
Mark Ruddat
Luke Rudolph
Double Major
Joseph Saladino
Mechanical Design Concentration
Mylla Santana
Double Major
Aritro Sarker
Minor: Materials
Matthew Segui
Cameron Shelley
Minor: Manufacturing Engineering
Jiwon Shon
Minor: Computer Science
Yicheng Si
Jacob Sledge
Keelan Smith
Nora Smith
Minor: English
Stephanie Steriti
Merel Sutherland
Double Major
Jacob Talbot
Terence Tan
Jena Taubert
Manufacturing Concentration
Jack Tervay
Double Major
Sean Thal
Mechanical Design Concentration
Chloe Trotta-Smith
Sequoia Truong
Double Major
Haggay Vardi
Aaron Vaz
Giovanni Vecchiarino
Minor: Industrial Engineering
Raul Villalobos
Molly Vincent
Alexander Wadsworth
Mechanical Design Concentration
Minor: Astrophysics
Minor: Robotics Engineering
Lucien Wallace
Double Major
Ethan Weisse
Evan Wertz
Mechanical Design Concentration
Jonathan Whooley
Minor: History
Cassidy Williams
Biomechanical Concentration
Double Major
Lily Wolf
Minor: Computer Science
Harry Wotton
Aunika Yasui
Minor: Spanish
Rebecca Young
Double Major
Anna Zauha

Mechanical Engineering cont.:
Michael Zembruski
Hannah Zink
Double Major
Minor: Computer Science

Physics:
Isaac Benjamin
Minor: Mathematics
Maximillian Hubbard
Luciano Malavasi
Double Major
Joshua Moy
Double Major
Minor: Mechanical Engineering
Michelle Sangillo
Alexandra Spezzano
Minor: Mathematics

Professional Writing:
Lauren Averka
Double Major
Kellie Bushe
Double Major
Ethan Chau
Writing Concentration
Double Major
Kylie Doehring
Double Major
Tiffany Foote
Double Major
Kelly Heffernan
Double Major
Caroline McLaughlin
Double Major
Alyssa Morgan
Double Major
Alexis Wood
Double Major
Jia Yazon
Double Major

Psychological Science:
Samantha Curtis
Diversity Science Concentration
Mira Kirschner
Psychobiology Concentration
Double Major
Lorena Nunes
Psychobiology Concentration
Minor: Biology
Katie Quinn-Cyr
Psychobiology Concentration
Double Major

Robotics Engineering:
Luis Aldarondo
Zane Altheimer
Arthur Ames
Double Major
Ashe Andrews
Minor: Computer Science
Samuel Appiah Kubi
Evan Arenburg
Christina Aube
Double Major
Chase Beausoleil
Double Major
Riley Blair
Double Major
Phil Brush
Double Major
Christopher Chow
Cameron Crane
Double Major
Camden Cummings
Jeffrey Davis
Megan DeSanty
Minor: Computer Science
Gabriel Demanche
Emma Dimmig
Nate Dixon
Double Major
Thai Duc Doan
Double Major
James Doherty
Cameron Earle
Soumaya El Mansouri
Minor: Electrical and Computer Engineering

Robotics Engineering cont.:

Edward Enyedy
Double Major
Stephen Fanning
Double Major
Mark Gagliardi
Double Major
Connor Gaudette
Double Major
Giovanni Giacalone
Tyler Giroux
Samay Govani
Double Major
Shivank Gupta
Double Major
Can Guven
Minor: Computer Science
Claire Higginson
Minor: Electrical and Computer Engineering
Minor: Music
Samson Hodges
Samara Holmes
Double Major
Luke Hoy
Yasar Idikut
Double Major
Megan Jacques
Akshay Jaitly
Nicholas Johannessen
Double Major
Minor: Manufacturing Engineering
Minor: Computer Science
Christopher Johnson
Timothy Klein
Double Major
Jatin Kohli
Double Major
Krish Kothimbakam
Owen Krause
Minor: Electrical and Computer Engineering
Justin Kyi
Minor: Computer Science
Isabelle Lachaux
Double Major
Liliana Loughlin
Ian MacInerney
Double Major
Andrew McKeen
Double Major
Conner McKevitt
Double Major
Elizabeth Minor
Joshua Moy
Double Major
Minor: Mechanical Engineering
Nicholas Moy
Danny Ngo
Double Major
Dylan Nguyen
Double Major
Nhi Nguyen
Double Major
Calvin Page
Double Major
Cole Parks
Double Major
Scott Pena
Cambria Pomeranz
Double Major
Tuomas Pyorre
Timothy Rinaldi
Double Major
Cristobal Rincon Rogers
Double Major
Jason Rockmael
Minor: Computer Science
Isa/Isabella Rosenstein
Jack Rothenberg
Double Major
Ana Roure
Dimitri Saliba
Double Major
Antonios Sevastos
Kathryn Stovall
Minor: Media Arts
Minor: Theatre
Alexander Sun
Double Major
Matthew Sweeney

Robotics Engineering cont.:

Jack Tervay
Double Major
Bryon Tom
Double Major
Dang Tran
V Valery
Minor: Interactive Media and Game Development
Sebastian Valle
Anthony Virone
Minor: Computer Science
Lehong Wang
Double Major
Gabriel Ward
Minor: Environmental and Sustainability Studies
Theodore Winter
Yuhan Wu
Puen Xu
Yifu Yuan
Double Major
Hannah Zink
Double Major
Minor: Computer Science
Tao Zou

Society, Technology and Policy:

Abigail Boafo
Double Major
Adam Lepore

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to approve the May 2024 graduate student graduation list

Motion: The Office of the Registrar reports that the following candidates have either completed all the requirements for the degree designated in the department or program indicated or are expected to complete their degree requirements before May 9, 2024. They therefore are or will be eligible to receive that degree, and on behalf of the Committee on Graduate Studies and Research, I move that – pending final verification by the Registrar that all those on the list have in fact completed their degree requirements - they be approved for May 9, 2024, graduation.

Doctor of Philosophy

Bioinformatics and Computational Biology:
Sara Amato
Huaming Sun
Jocelyn Tourtellotte

Biomedical Engineering:
William DeMaria
Andre Figueroa Milla
Richard Thyden

Business Administration:
Haadi Mombini
Shimi Zhou

Chemical Engineering:
Elizabeth Belden
Sathya Narayanan Jagadeesan

Civil Engineering:
Oussama Khouchani
Chao Wang
Zhiying Xiao

Computer Science:
Apiwat Ditthapron
Yunsen Lei
Shruti Mahajan
Guanyi Mou

Data Science:
Biao Yin
Dongyu Zhang

Electrical and Computer Engineering:
Zhuoran Su
Haopeng Wang
Zane Weissman

Interdisciplinary:
Anne Johnson

Materials Science and Engineering:
Bonnie Whitney
Haoxing You

Mathematical Sciences:
Jiamin Jian
Peiyao Lai

Physics:
Erika Colin Ulloa

Robotics Engineering:
Alex Chiluisa

Master of Business Administration

Mitra Anand
Michelle Cordoba Gunter
Antoine Crews
Jaime Dillon
Peter Nash
Katherine Novak
John Obayemi
Todd Pietrasiak
Allison Sansone
Ava Schlesinger
Adam Sears
Mark Solomon

Master of Computer Science

Jarrett Arredondo
Huibin Cui
Emily DeBaca
Yuyuan Liu
Corey Nolan
Christopher Petrella
Daniel Santoro
Minh Hang Truong

Master of Engineering

Biomedical Engineering:
John Clewley
Elliot Gott
Michael Haroutunian
Abigail Maynard
Molly McGinn
Mylla Santana
Miriam Sayegh
Luese Ufuah
Ina Wong

Electrical and Computer Engineering:
Spencer Eckert
Paul Larue
Wenting Li
Yiwei Zheng

Power Systems Engineering:
Emilio Baca
Hamad Elnneel Eisa
Sondy Jean
Bunyamin Tufan

Master of Mathematics for Educators

Crystal Zaimi

Master of Science

Aerospace Engineering:
Emily Abbe
Ryan Brunelle
Joseph Calomo
Robert Devlin
Kerim Dovletov
Spencer Granlund
John Kerwin
Theresa Larson
Cole Lederman
Megan Malito
Matthew McMahon
Noah Mester
Marina Nelson
Cyril Ogbebor
Nick Orlovsky
Julian Robles
Evan Russell
Zachary Winston
Maria Wojciechowski
Aunika Yasui

Applied Mathematics:
Abigail Lindner
Anthony Vuolo

Applied Physics:
Aaron Demers
Jacen Urbaniak

Applied Statistics:
Hammed Olayinka
Richard Plunkett

Biochemistry:
Patrick Bailey
Grace Hadley
Lindsay Hoey
Jake McDonough
Taylor Jane McGinty
Sofi Murray
Eva Plankey
MacKenzie Sullivan

Bioinformatics and Computational Biology:
Usha Appadu
Yue Bao
Adam LaBombard
Emmaline Raven

Biology and Biotechnology:
Abigail O'Connor

Biomedical Engineering:
Cecilia Berniac
Charlotte Kokernak
Samantha Katerina Lopez
Emma Smith
Reese Swedberg
Alexandra Taylor
Andrew Voronin
Adrienne Whitney
Kathryn Woodland
Niloufar Zaremanshadi
Zirui Zheng

Bioscience Management:
Joseph Allen
Farah Crawford
Dora Deab
Tanner Dobrzanski
Hamzah Dweik
Wilfredo Ferreira
Reinalyn Foster
Emanuel Kahsai
Andrew Kiousis

Biotechnology:
Hannah Allen
Nicholas Brancazio
Thomas Dumont
Victoria Pitney

Business Analytics:
Binaisha Dsouza
Marketing Analytics Concentration
Advanced Business Analytics Methods Concentration
Jiaying He
Operations Analytics Concentration
Marketing Analytics Concentration
Darshan Patel
Marketing Analytics Concentration
Advanced Business Analytics Methods Concentration
Jared Simkewicz
Advanced Business Analytics Methods Concentration
Marketing Analytics Concentration
Kefei Zhang
Operations Analytics Concentration
Marketing Analytics Concentration

Chemical Engineering:
Lucas Bazydola
Henry Liro
Matthew Pelletier
Antonio Sassano

Chemistry:
Cierra Bair
Gabriel Del Rossi
Eliza Mastergeorge

Civil Engineering:
Adam Bartlett
Jonathan Benoit
Stephanie Bishop
Mark Delia
Ritesh Prasannakumar
Elizabeth Valentine
Fatimah Wattar

Community Climate Adaptation:
Solange Uwera

Computer Science:
Jacob Adams
Megan Aloise
Talia Andrews
Adam Beauchaine
Anthony Chen
Ian Coolidge
Theo Coppola
Elise Deshusses
Parth Jay Dhruv
Kaley Du
Marek Garbaczonek
Jiaqi Ji
Andrew Kerekon
Muralidharan Kumaravel
Sizhe Li
Yu-Chi Liang
Alexander Mitchell
Amey Dilipkumar More
Declan Murphy
Padmesh Rajaram Naik
Qui Nguyen
Bernhard Nordemann
Michael O'Connor
Vansh Patel
Akanksha Pawar
Grant Perkins
Olivia Raisbeck
Mark Renzi
Zachary Sarrett
Caleb Scopetski
Oliver Shulman
Vignesh Sundaram
Jenna Tripoli
Sai Varun Vadlamudi
Julian Vaill
Rakesh Veetekat
Justin Weintraub
Aria Yan
Grace Yue
Naitik Zaveri
Cather Zhang
Edison Zhang
Mario Zyla

Construction Project Management:
Mikel Cunningham

Cyber Security:
Joao Nonato Da Costa Pereira
Patrick Hagearty
Mira Plante

Data Science:
Aukkawut Ammartayakun
Michael Beinor
Christina Berthiaume
Martin Blatz
William Burke
Joseph Calcasola
Sree Likhith Dasari
Snehith Varma Datla
Joshua DeOliveira
Joshua Debare
Ryan Dieselman
Yuan Feng
Adityavikram Gurao
Camille Hanna
Dennis Hofmann
Sidhanth Subhash Jain
Janette Jerusal
Yiming Liu
Yujun Mao
Drew Morris
Duy Pham
Ngoc Pham
Siddhartha Pradhan
Chandra Harsha Rachabathuni
Luke Savoie
Eric Schuman
Trevor Shaw
Ayush Avinash Shinde
Avantika Shrestha
Saral Shrestha
Megan Sin
Matthew Suyer
Darshan Swami

Data Science cont.:
Tanishq Samir Tapiawala
Xiaofan Zhou

Electrical and Computer Engineering:
Alexander Demirs
Aboli Deshmukh
Miguel Gonzalez
Joshua Hollyer
Josh Lariviere
Zhuolin Liu
Jonathan Lopez
Abijith M
John Matthews
Somtochukwu Okwuosah
Adithya Ramesh
Nathaniel Reppucci
Olivia Rockrohr
Marc Rosenthal
Michael Rothstein
Ivee Diane Santos
Drew Solomon
Christopher Thomas
Antonio Torres
Jessica Vaquera
Tyler Wong
Logan Young
Xuechu Yu

Environmental Engineering:
Anthony Bomba
Michael Nexon
Andrew Panneton
Evan Rios
Kaleigh Walsh
Trisha Worthington

Fire Protection Engineering:
Nathan Abramson
Abigail Benoit
Emilia Casagrande

Information Technology:
Qianwen Ge
Data Analytics Concentration
Information Systems Design Concentration
Allen Gutierrez
Digital Transformation Concentration
Data Analytics Concentration
Dharmi Hemani
Data Analytics Concentration
Information Systems Design Concentration
Aameer Shaikh
Data Analytics Concentration
Information Systems Design Concentration
Ribah Mohammed Shahid Shaikh
Data Analytics Concentration
Information Systems Design Concentration
Vishwaben Solanki
Information Systems Design Concentration
Data Analytics Concentration
Pranav Tawade
Data Analytics Concentration
Information Systems Design Concentration
Jose Thampi
Data Analytics Concentration
Information Systems Design Concentration
Ujwal Vijay Kumar
Digital Transformation Concentration
Austin Zhou
Data Analytics Concentration
Information Systems Design Concentration

Innovation with User Experience:
Florkenthia Jolibois
Thi Quynh Ha Nguyen

Interactive Media and Game Development:
Olivia Bell
Daniel Enriquez
Zhechuan Hu
Bharat Monavarthi

Interactive Media and Game Development cont.:
Utsav Sanghvi
Surya Srinivasan
Qingyang Wang
Xingge Yang

Management:
Michael Akstin
Safiya Ali
Brianna Ankstitus
Franco Bazzini
Alec Beesmer
Grace Blackadar
Samantha Curtis
Eliza Dion
Amitai Erfanian
Allison Escott
Jessica Feeney
Brian Fox
Kirsten Harrod
Mikkel Hersum
Abigael Kihu
Andrew Neamtu
Amy Ngan
Aidan Nunes
Adam Olson
Wasef Raza
Benjamin Sseruwagi
Katelyn Tropeano
Molly Vincent
Connor West
Adrianna Yuen
Anna Zauha

Manufacturing Engineering:
Victor Piglowski
William Rooney
Caitlin Tang-Hornbuckle

Materials Science and Engineering:
Thomas Chelman
Ethan Cummings
Noah Kantor
William Michels
Mark Ruddat
Lily Spero
Aubrey Winiarski

Mechanical Engineering:
Sarah Abatiello
Aashish Singh Alag
Ben Amado
Yu Him Au
Francesco Barbera
Heath Bastow
Gabriel Brown
Miguel Bucaro
Rachel Chan
Allison Colon-Heyliger
Patrick Daly
Michael Daton
Brian Desjardins
Neel Adwait Dharmadhikari
Gabriela DiMauro
Thianar Djigal
Trevor Faber
Dylan Flegel
Matthew Gadziala
Alexander Galvan
Natalie Gonthier
Yutai Han
Liam Hemmerling
Nikita Igoshin
Megan Jacene
Samuel Krimmel
Vincent Liberto
James Martin
Daniel Moyer
Michael Nason
Atharva Pandhare
Andrew Peyton
Samuel Sands
Matthew Segui
Eric Sherbocker
Stephanie Steriti
Arvind Sureshkumar
Terence Tan
Francesco Valagussa
James Van Milligen
Erika Varady
Raul Villalobos

Mechanical Engineering cont.:
Brian Webber
Noah Wolf

Neuroscience:
Bridget Rinkel

Operations and Supply Chain Analytics:
Swarnima Biswari
Alison Brenda Alexandrina George
Abigail Holmes
Elijah Kennedy
Caitlin Kuzma
Sarah McKeage

Physics:
Alex Kiely
Anna Mederer
Patrick O'Mullan

Physics for Educators:
Chung Dao Lui

Power Systems Management:
Timothy Bailey
Tenele Habangaan
Aidan Murphy

Robotics Engineering:
Jesulona Akinyele
Evan Arenburg
Soham Aserkar
Emily Austin
Will Babincsak
Sri Lakshmi Hasitha Bachimanchi
Anoushka Baidya
Shreya Bang
Mayank Bansal
Michael Beskid
Omkar Bharambe
Ankush Singh Bhardwaj
Dheeraj Bhogisetty
Martin Bleakley
Shreyas Chandra Sekhar
Girivaasan Chandrasekaran
Christian Chang
Shrishailya Chavan
Keith Chester
Anagha Dangle
Jeffrey Davis
Amrit Krishna Dayanand
Christopher DeMaio
Robert Demont
Chaitanya Sriram Gaddipati
Om Vinayak Gaikwad
Varun Gampa
Kyle Gloss
Jordan Grotz
Sanya Gulati
Ntmitrii Gyrichidi
Kristoffer Hidalgo
Maanav Iyengar
Akshay Jaitly
Anshul Jindal
Vaibhav Nandkumar Kadam
Raj Kalathiya
Krish Kothimbakam
Loahit Krishnamurthy
Mihir Mangesh Kulkarni
Colton Layhue
Shiva Surya Lolla
Zhuofan Lu
Upasana Mahanti
Neha Manish Malaviya
Gowri Shankar Sai Manikandan
Benjamin Mart
Sean McCormick
Joy Mehta
Tanish Mishra
Kyle Mitchell
Deepak Harshal Nagle
Rajus Nagwekar
Shounak Sheshadri Naik
Prasanna Natu
Lalith Athithya Navaneetha Krishnan
Hoang Nguyen
Philip Ni
Aditya Kailash Nisal
Anuj Pai Raikar
Rohin Siddhartha Palaniappan Venkateswaran
Soumitra Pandit

Robotics Engineering cont.:

Shaurya Parashar
Abizer Patanwala
Thira Kismat Patel
Dushyant Astik Patil
Sai Ramana Kiran Pinnama Raju
Nikunj Reddy Polasani
Pierre Rafiq
Jason Rockmael
Hitanshu Shah
Sumeet Dinesh Shanbhag
Keshubh Sharma
Tript Sharma
Brandon Simpson
Uthiralakshmi Sivaraman
Matthew Sweeney
Ankit Talele
Kip Talman
Aabha Tamhankar
Dang Tran
Sean Tseng
Aadesh Surendra Varude
Rene Verduzco
Swapneel Wagholikar
Max Weissman
Maxwell Wolfley
Mariya Zagainova

Science and Technology for Innovation in Global Development:

Enis Agyeman Boateng
Jezabel Aleyda Aponte Figueroa
Samuel Yusuf

Systems Engineering:

Derek Byrne
Ashley Corbeil
Alfreda Delong
Maya Ellis
Shannon Ellsworth
Grace Gerhardt
Irina Lavryonova
Donna Rogers

Systems Engineering Leadership:

Daniel Paradiso

Date: May 7, 2024
To: WPI Faculty
From: Committee on Governance (Prof. Heineman, Chair)
Committee on Appointments and Promotions (Prof. Martin, Prof. Weathers, Co-Chairs)
Re: Motion to provide guidelines for initiating searches for new Department Heads and for the appointments and terms of Interim Department Heads

Motion: The Committee on Governance (COG) and the Committee on Appointments and Promotions (COAP) recommends, and we move that Chapter Two, Section 5 (Roles and Responsibilities, Initial Appointments, Reviews, and Reappointments of Department Heads) be modified by adding to Subsection 5.b (Initial Appointments of Department Heads) guidelines for initiating searches for new Department Heads, and by adding Subsection 5.e (Appointments and Terms of Interim Department Heads) to provide guidelines for the appointments and the terms of Interim Department Heads, as described below.

Description of the Proposed Modifications:
(Text to be added is in red. Text to be removed is ~~struck-out~~.)

Faculty Handbook:
Chapter Two: ACADEMIC APPOINTMENTS
Section 5: ROLES AND RESPONSIBILITIES, INITIAL APPOINTMENTS, REVIEWS, AND REAPPOINTMENTS OF DEPARTMENT HEADS

5. ROLES AND RESPONSIBILITIES, INTIAL APPOINTMENTS, EVALUATIONS, AND REAPPOINTMENTS OF DEPARTMENT HEADS

…….

b. Initial Appointment of Department Heads

i. *Term of Initial Appointment:* The initial appointment for any Department Head is for a five-year period.

ii. *Appointment Process:* When a new Department Head is to be selected from either inside or outside of WPI, the Dean will first consult with the faculty in the department concerned to determine the best course of action in the interests of the department. A department and/or those faculty members within the department wishing to provide its/their input in a confidential and/or anonymous manner should be provided the opportunity to do so. ~~and~~ Accounting for this input, and in consultation with the Provost, the Dean will then initiate the search and form a search committee according to the following procedures.

If it is known a year in advance that the current Department Head will not continue in their current role, then the search for the next Department Head will begin early in the next academic year following the year in which the Department Head vacancy first became known. If the search is unsuccessful, then an interim Department Head will be appointed according to Section 5.e below.

A search committee consists of two faculty members elected by the department, one member of the Committee on Appointments and Promotions (COAP) selected by COAP, a faculty member appointed by the Provost, and the Dean or their representative who serves as Chair of the search committee. The search committee will establish its procedures for operation consistent with the following requirements:

The search committee will solicit nominations and applications for the position, evaluate the applicants, and select at least two candidates to interview for the position (unless there is only one

applicant in an internal search). As part of the interview process, the search committee will make arrangements for each of the candidates to meet with the departmental faculty. The search committee will determine the preferences of the members of the department, and weigh those heavily in arriving at its own preferences.

The Dean submits to the Provost the names of the acceptable candidates as determined by the search committee, the Dean's recommendation, the preferences and comments of the search committee, and the preferences and comments of the departmental faculty. Whereas collaboration is essential to WPI, Deans are expected to collaborate with other Deans when evaluating Department Heads for appointment in departments where collaboration across schools is significant (as defined by the Provost). The Committee on Appointments and Promotions is given copies of all documents submitted to the Provost concerning the selection.

The Provost, after consultation with the President, generally will appoint one of the acceptable candidates forwarded by the Dean as Department Head. However, if none of the candidates is acceptable to the Provost, the reasons will be discussed with the search committee and the Committee on Appointments and Promotions, and the search committee will continue the selection process.

In this manner, Department Heads are appointed by the Provost upon the recommendation of the Dean and the Committee on Appointments and Promotions and subject to approval by the President.

……

d. <u>Reappointment of Department Heads</u>

i. <u>*Term and Limits of Reappointment*</u>*:* Only one reappointment may be made, for a second term of five years and for a maximum total of ten years of service as Department Head, unless special circumstances exist.

ii. <u>*Reappointment Process*</u>*:* The reappointment of a Department Head for a second term will involve the following procedure.

A. In the spring of the fourth year of the Department Head's first term, the Committee on Appointments and Promotions will evaluate the Department Head for reappointment. The evaluation will involve:

- Review of all written materials obtained in the second and fourth year reviews (as described above in Section 5c).
- Confidential interviews with all faculty members in the department;
- An interview with the Department Head involved.
- Collection and review of any other information that COAP believes will influence the evaluation.

B. The Committee on Appointments and Promotions will report its recommendation in writing concerning reappointment to the Dean before the end of D-term of the fourth year of the Department Head's first term.

C. The Dean will provide the Provost both their recommendations and a copy of the Committee on Appointments and Promotions report concerning evaluation and reappointment. Whereas collaboration is essential to WPI, Deans are expected to collaborate with other Deans when evaluating Department Heads for reappointment in departments where collaboration across schools is significant (as defined by the Provost).

D. The Provost, after consultation with the President, will decide on the reappointment. The Provost will discuss their decision with the Committee on Appointments and Promotions.

e. Appointments and Terms of Interim Department Heads

i. Appointments of Interim Department Heads: Interim Department Heads should only be appointed due to unanticipated circumstances. If, in a given academic year, due to unanticipated circumstances, it is necessary to appoint an interim Department Head, then the Dean will consult with the faculty members in the department concerned to determine the choice that is in the best interests of the department. A department and/or those faculty members within the department wishing to provide its/their input in a confidential and/or anonymous manner will be provided the opportunity to do so. The Dean will share the input from the department with the Provost and will make a recommendation concerning the interim appointment. The interim appointment will be made by the Provost in timely fashion and in the same academic year in which the vacancy occurs.

ii. Term Limits of Interim Department Heads: A Department should not be led by Interim Department Head(s) for more than two consecutive years. For this reason, the search for a new Department Head will begin by no later than early in the next academic year following the year in which the Department Head vacancy first became known. If the search is not successful, then an interim appointment will be made by the Provost (with input from the department and with a recommendation from the Dean) for an additional year (even if it is beyond the second) while the search for a new Department Head is continued.

Rationale:

At WPI, the leadership role of a Department Head, serving in one - or typically two - five-year terms, is much larger than that of a rotating Department Chair (typically serving one two- or three-year term) at many other universities. For this reason, a WPI academic department with an interim Department Head, even for a single year but especially for an extended period of time, can lose its momentum, have difficulty recruiting and retaining new faculty members, and hesitate to take on challenges that have longer-term departmental implications. In addition to these disadvantages, the fact that a colleague has served in the interim role may well discourage other qualified candidates – especially internal candidates - from applying for the permanent position, especially if the search itself is internal. It is therefore essential that Department Head transitions, whether they occur due to anticipated or unanticipated circumstance, be handled smoothly, efficiently, and with a minimum of disruption to the department concerned.

In the meantime, because several of our academic departments have been led for two years by interim Department Heads, the Committee on Appointments and Promotions recently began including interim Department Heads in the two-year review process that was originally intended for Department Heads who were appointed to full five-year terms. In response, the WPI faculty approved a formal policy at the March 13,2024 faculty meeting that extended the two-year review process to interim Department Heads, as well.

However, the general concern raised by the faculty, by the Committee on Appointments and Promotions, and by the Committee on Governance at the time was that the extension of the review process to interim Department Heads in their second year was not to be interpreted as an endorsement of the idea that interim Department Heads should serve for extended periods. For this very reason, the idea that the review of interim Department Heads should be extended beyond the second year was rejected by the faculty - with the understanding that a motion to limit the terms of interim Department Heads in a sensible manner would soon be proposed by the Committee on Governance and the Committee on Appointments and Promotions.

This proposal addresses rational and flexible limits that should be placed on the appointments and terms of interim Department Heads in two ways:

- First, the proposal focuses on the ***easily anticipated circumstances*** in which it is known a year in

advance that the current Department Head will not continue in their current role. In these cases, the proposal requires that a timely search for the next permanent Department Head begin early in the next academic year following the year in which the Department Head vacancy first became known. In this manner, if the search is successful, ***this schedule eliminates the need to appoint an interim Department Head entirely.***

- Second, the motion focuses on ***unanticipated circumstances*** in which it is necessary to appoint an interim Department Head. In these cases, the proposal ensures that the faculty members within the department have formal input into the decision about the appointment, ensures that the Dean of the appropriate school plays a prominent role in collaborating with and making a recommendation to the Provost, and relies on the Provost to make the formal interim appointment. Moreover, ***the proposal establishes a normal upper limit of two years before a permanent Department Head is appointed***, which again requires that a timely search be initiated – in this case by no later than the early in the academic year following the year in which the unanticipated Department Head vacancy first became known.

Finally, the proposal also clarifies the variety of opportunities that departmental faculty members shall be provided to give their input concerning the best interests of the department before a search for a new Department Head is undertaken.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Financial and Administrative Policy (Prof. Walker, Chair)
Fringe Benefits Committee (Prof. Dempski, Chair)
Committee on Governance (Prof. Heineman, Chair)
Re: Motion to modify the membership on FBC and the representation in FBC deliberations

Motion: The Committee on Financial and Administration Policy (FAP), the Fringe Benefits Committee (FBC), and the Committee on Governance (COG) recommend, and we move that the WPI faculty membership on the FBC and staff representation in FBC deliberations (as described in Bylaw Three, Section VIII.a of the Faculty Handbook) be modified, as described below.

Description of the Proposed Modifications:

Overview:
This proposal would modify the faculty membership on the Fringe Benefits Committee (FBC) and the staff representation in Fringe Benefits Committee (FBC) deliberations in order to enhance the representation and influence of staff members in decisions that affect their benefits.

As the FBC currently operates, the FBC consists of seven faculty members who invite five WPI staff members join FBC deliberations and to vote on matters related to benefits that are of equal concern to the WPI faculty and staff. The five members of the WPI staff are chosen by the V.P. of Talent and Inclusion to serve three-year staggered terms.

The proposed modifications would reset the faculty membership on the FBC and the staff representation in FBC deliberations as follows:

1. *Faculty Representation:*
    - Decrease the number of faculty representatives from seven to five to equal the number of invited staff representatives. In addition, the committee has grown too large with 12 members and this decrease will help this committee to run more smoothly. COG and FAP will now coordinate their faculty appointments on FBC to balance committee representation.
2. *Staff Appointments:*
    - The five staff members will be appointed by the Staff Council with input from WPI Talent and Inclusion. The staff members are chosen to proportionally represent exempt and non-exempt employees and to promote a representative selection of eligible staff members across university divisions.
3. *Vice-Chair Appointment:*
    - Introduce a vice-chair role for the staff to ensure shared leadership on matters related to benefits that are of equal concern to the WPI faculty and staff. The Vice-Chair will serve as one of the five staff members described in item 2 above and would be appointed by the Staff Council.
4. *Term of Service for Staff:*
    - The Vice-Chair will be appointed from among the current Staff Council members to a one-year (renewable) term, up to two consecutive years.
    - The remaining four - staff members will serve three-year staggered (renewable) terms and do not have to be members of the Staff Council to serve. This arrangement ensures continuity and experienced participation over time.

Proposed Changes to the Faculty Handbook:
Bylaw Three, Section VIII.a
The Fringe Benefits Committee (FBC)
(with text to be added in red, and text to be deleted ~~struckthrough~~)

……

Membership and Appointment Procedures:
The FBC consists of a Chair to be selected for one-year renewable terms from FAP from among its faculty members, two ~~tenured or tenure-track and one secured nontenure-track~~ faculty members ~~selected~~ appointed by the Committee on Governance (COG), and two ~~additional tenured or tenure-track and one secured nontenure-track~~ faculty members ~~selected~~ appointed by FAP. Both COG and FAP will coordinate their appointments to balance representation on FBC. Faculty members of the FBC (other than the Chair) will serve three-year staggered terms. Current COG or FAP members appointed to the FBC who have not completed three years of service on FBC when their COG or FAP terms expire will continue on FBC to complete their FBC terms.

Although formally the FBC is constituted as above, operationally it invites five members of the WPI staff to join its deliberations and to vote on matters related to benefits that are of equal concern to the WPI faculty and staff. The five members of the WPI staff are chosen by the Staff Council with input from WPI ~~V.P. of~~ Talent and Inclusion. These staff members are comprised of one Vice-Chair chosen by the Staff Council from among its members to serve a one-year (renewable) term (up to a maximum of two years) and four staff members to serve three-year staggered (renewable) terms. The staff members are chosen to proportionally represent exempt and non-exempt employees and to promote a representative selection of eligible staff members across university divisions.

Either the V.P. of Talent and Inclusion or the Director of Benefits and Wellness serves as the liaison between the FBC and the Division of Talent and Inclusion. The liaison provides information requested by the FBC to conduct its deliberations in an informed manner. Neither the V.P. of Talent and Inclusion nor the Director of Benefits and Wellness should serve as one of the five invited voting WPI staff members.

Rationale:
These proposed modifications will balance faculty and staff representation in the deliberations of the FBC on matters related to benefits that are of equal concern to both constituencies. Equalizing participation in these deliberations corrects an imbalance that was inadvertently created when the number of faculty members was increased to include two additional (nontenure-track) faculty members without increasing the number of staff members at the same time.

In addition, the proposed modifications include a process by which the staff members are selected by the Saff Council with input from the Division of Talent and Inclusion that will ensure that decisions and recommendations on these matters properly reflect the comprehensive needs and perspectives of WPI's diverse staff community.

Specifically, the modifications will provide the following three benefits:

- *Balanced Leadership:* A staff vice-chair ensures equitable leadership on matters related to benefits that are of equal concern to the WPI faculty and staff, aligning with WPI's commitment to shared governance.
- *Representative Inclusion:* The diverse composition of staff members ensures that varied perspectives and interests are considered in the FBC's deliberations concerning relevant benefits.

- *Continuity and Experience:* Staggered three-year terms for staff members foster sustained involvement and knowledge accumulation, contributing to more informed and stable decision-making.

Finally, the proposed modifications set an example of a collaborative and balanced approach to decision-making at WPI, and demonstrate how WPI's Faculty Governance (in this case, through FBC, FAP, and COG) and WPI's Staff Council continue to work well together.

Implementation:

- The Staff Council will proceed with the selection process for the Vice-Chair and the four staff members, integrating them into the proposed FBC framework, effective July 1, 2024. The selections of staff members will include the designation of the term lengths for each member (up to three years) to facilitate a proper staggering of terms in future years.
- The three faculty members whose terms on FBC end on June 30, 2024 (i.e. the current Chair appointed by FAP, one current TTT faculty member appointed by FAP, and one current TTT faculty member appointed by COG) will rotate off the FBC, as scheduled. This will leave one TTT and one secured NTT faculty member selected by COG (with terms that end in 2026 and 2025, respectively), and one TTT and one secured NTT faculty member selected by FAP (with terms that end in 2025 and 2026, respectively).
    - For 2024-25: FAP will appoint one of its members to serve as Chair of FBC for that academic year.
    - In 2025-26: FAP will appoint a faculty member to serve a three-year term from 2025-2028, and COG will appoint a faculty member to serve a two-year term from 2025-2027 – as included in the table below.
    - In all subsequent years, FAP will appoint a Chair of FBC for one year, and COG and/or FAP will make their three-year faculty appointments as needed to maintain the staggered three-year term rotation – as summarized in the table below.

Final Year of Term - for FBC Faculty Members
(by Academic Year and Membership Status)

	AY 24-25	AY 25-26	AY 26-27	AY 27-28	AY 28-29
COG Appt: Fac. Mem.	2026	2026	**2029**	2029	2029
COG Appt: Fac. Mem.	2025	**2027**	2027	**2030**	2030
FAP Appt: Fac. Mem.	2025	**2028**	2028	2028	**2031**
FAP Appt: Fac. Mem.	2026	2026	**2029**	2029	2029

Note: New appointments are denoted in **bold red.**

Date: May 7, 2024
To: WPI Faculty
From: Committee on Governance (Prof. Heineman, Chair)
Re: Motion to clarify eligibility for election to faculty governance committees based on administrative title

Motion: The Committee on Governance (COG) recommends, and I move that Chapter One, Section One (Definition of the Faculty) and Chapter One, Bylaw Two, Section II (Membership and Officers of Faculty Committees) of the Faculty Handbook be modified to designate by administrative title those faculty members who are also members of the Administration and to clarify eligibility for election to faculty governance committees, as described below.

Description of the Proposed Modifications:
(Text to be added is highlighted in yellow. Text removed is ~~struck out~~.)

Faculty Handbook: Motion to clarify eligibility for election to faculty governance committees based on administrative title
Chapter One – GOVERNANCE: CONSTITUTION AND BYLAWS OF THE WPI FACULTY
Section One – DEFINITION AND GOVERNANCE OF THE FACULTY
(Text to be added is highlighted in yellow.)

DEFINITION OF THE FACULTY
The Faculty of Worcester Polytechnic Institute consists of all those individuals who hold tenured, tenure-track, or full time nontenure-track faculty appointments. Tenured and tenure-track faculty members are the President, the Provost, and those individuals holding full-time appointments with the following exact titles: Professor, Associate Professor, Assistant Professor, Professor of Teaching, Associate Professor of Teaching, and Assistant Professor of Teaching. Full-time nontenure-track faculty members are those individuals holding full-time appointments with the following exact titles: Teaching Professor, Associate Teaching Professor, Assistant Teaching Professor, Senior Instructor, Instructor, Professor of Practice, Research Professor, Associate Research Professor, and Assistant Research Professor. Any faculty member who also holds the administrative title of President, Provost, Associate or Vice Provost, Dean, or Associate Dean is also a member of the Administration.

Faculty Handbook:
Chapter One – GOVERNANCE: CONSTITUTION AND BYLAWS OF THE WPI FACULTY
Bylaw Two – GENERAL RULES FORCOMMITTEES OF THE FACULTY
Section II - Membership and Officers of Faculty Committees
(Text to be added is highlighted in yellow. Text removed is ~~struck out~~.)

Membership and Officers of Faculty Committees
Committees of the Faculty, whether standing or *ad hoc*, may consist of members of the Faculty, members of the Administration, and WPI students. Faculty members of committees are elected by the Faculty or appointed by the President or Provost or a committee of the Faculty charged with this responsibility. In any case, the majority of faculty members on any committee must be elected by the Faculty. All full-time faculty members (including Department Heads) who are tenured, are on the tenure track, or hold non-temporary secured nontenure-track teaching appointments that are made with provisions for a long-term institutional commitment from WPI who are not members of the Administration are eligible to be elected. Faculty members who are also members of the Administration are ineligible to be elected. If the membership of a committee is to include~~s~~ members of the Administration, such members ~~may be~~ are either explicitly identified as *ex officio* or may be appointed ~~by the President , or Provost,~~ when the appointed member is explicitly identified as a representative of the Administration or of an Administrative Division or Office, according to the ~~as~~ appropriate procedure described in this Faculty

Handbook. Student members of faculty committees are selected annually by the students, with the students determining the procedures.

Rationale:

This motion would clarify which faculty members are eligible and ineligible for election to our Faculty Governance committees. The existing confusion has centered on the eligibility of members of our faculty who also have formal administrative responsibilities. The problem has been due in large part to an implicit expectation that some cutoff on the percentage of time spent on administrative responsibilities will provide the distinction between those faculty members who are eligible for election and those who are not. However, oftentimes those percentages are not exactly known or specified, and in any case a fixed cutoff would be quantitatively arbitrary and not reflective of their campus roles.

Instead, the proposal is based on the qualitative distinction between faculty members who are members of the Administration, on the one hand, and faculty members who simply have administrative responsibilities, on the other hand. The proposal makes this important qualitative distinction by employing titles typically associated in higher education with the Academic Administration (i.e. President, Provost, Associate and Vice Provost, Dean, and Associate Dean) to identify our faculty members who are also members of our Administration, regardless of the fraction of their time devoted to their role in the Administration. In this way, it also recognizes that many faculty members who have administrative responsibilities (i.e. department heads, associate department heads, program directors, center directors, etc.) are not members of the Administration, regardless of the fraction of their time they devote to their administrative responsibilities.

The proposal is also based on the principle that, in addition to populating our committees with elected faculty members whose positions do not present any apparent or unnecessary complications from additional formal connections to the Administration, our faculty governance committees should include – as it always has - appropriate participation by *ex officio* members of the Administration, as well as members of the Administration and appointed representatives of the Administration (oftentimes by the President and the Provost) through its formal and carefully specified membership structure.

In this manner, the proposal will clarify a longstanding confusion in a way that is: a) simple to implement; b) based on a common understanding of the distinction between faculty and administration; c) consistent with our continuing commitment to ; and d) faithful to our strong tradition of collaboration between faculty and administration in our faculty governance processes.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Policy (Prof. Calli, Chair)
Re: Motion to clarify the academic standing policy for students on reduced course load

Motion: On behalf of the Committee on Academic Policy, I move that the academic standing policy for students on reduced course load be clarified in the Undergraduate Catalog, as described below.

Description of the Proposed Policy Clarifications:
(Underlined text to be inserted in the Undergraduate Catalog https://wpi.cleancatalog.net/academic-standing or pg. 68-70, above the Part Time Students section)

Reduced Course Load Students

Students who have a reduced course load accommodation approved through the Office of Accessibility Services (see Reduced Course Load Procedures) are limited to registering for 4/3 units per semester (2/3 for each 7-week term) plus one WPE course. Reduced course load students must complete at least 3/3 units of academic work per semester to maintain satisfactory academic progress.

Students on a reduced course load approved by the Office of Accessibility Services are subject to the same review schedule as full-time students. Note: this applies only to students on an approved reduced course load; students who are not on an approved reduced course load and choose not to register for a full load in any semester follow the standard requirements for satisfactory progress.

Rationale:
It has been long-standing practice that a student on a reduced course load must pass 3/3 to stay in good standing because of this registration limit, however it was never added to the catalog. This motion seeks to correct this oversight by formalizing this accepted current practice.

Implementation Date: Implementation date for this action is the 2024-2025 academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to establish an M.S. program in Integrated STEM Education, including 4 new courses (EDU 590 Graduate Project Seminar, EDU 597 Integrated STEM Capstone Project, EDU 598 Integrated STEM Graduate Qualifying Project, and EDU 599 Integrated Stem Thesis)

Motion: On behalf of the STEM Education Center, the Committee on Graduate Studies and Research recommends, and I move that an M.S. degree program in Integrated STEM Education be established (including four new courses: EDU 590 Graduate Project Seminar: EDU 597 Integrated STEM Capstone Project; EDU 598 Integrated STEM Graduate Qualifying Project; and EDU 599 Integrated Stem Thesis) as described below.

Description of the Motion:

1. **Description of the MS Program in Integrated Stem Education**
   Proposed Additions to the Graduate Catalog

Program's Goals and Objectives
The Master of Science in Integrated STEM Education couples WPI's strengths in theory & practice with innovative models for teaching STEM through project-based learning (PBL). The program provides candidates with the knowledge and skills for the myriad applications of transdisciplinary STEM Education in different educational contexts.

This program is designed for practicing PK-12 educators who are looking to advance their knowledge while having practical components to immediately use in their classroom or educational setting. Individuals enrolled in this program could pursue this degree synchronously online. All STEM education courses can be completed online synchronously, and a subset of elective courses can be taken either in person or online. The program director will provide guidance to determine which courses are offered fully online.

Graduates of the program will gain tools for conducting high-quality STEM education teaching and research in PreK-12 settings, supporting learners (young and adults alike) in developing problem-solving, critical thinking, communication, and collaboration skills that benefit their lives and communities.

Degree Program's Requirements
The Master of Science in Integrated STEM Education program requires a minimum of 30 semester credit hours of graduate coursework. The curriculum is composed of 3 core courses in STEM Education (9 credits), 4 elective courses (12 credits) and 2 courses focused on the final project: research methods (3 credits) and final project (GQP, Capstone, or Research thesis – 6 credits).

- ***STEM Education Core Courses***
  All candidates will complete 3 courses in STEM Education Pedagogy, with the option to take up to 6 courses (in lieu of content electives).
  EDU 500: Foundations of Integrated STEM Education (required; 3 credits)
  EDU 510: Classroom Climate that Supports Diverse STEM Learners (required; 3 credits)
  EDU 520: STEM & Project-Based Learning Curriculum (3 credits).
  EDU 530: Performance Assessments in STEM Education (3 credits)
  EDU 540: Informal STEM Education (3 credits)

EDU 550: Collaboration & Teamwork in STEM Education (3 credits)
EDU 580: Special Topics in STEM Education (3 credits)

- ***Elective Courses***
  Candidates will choose 4 elective courses from the list of existing courses below. Taking 4 courses from the same program will award them a concentration in this area. The program director will provide information and guidance to determine which courses are offered fully online.

  Biology & Biotechnology
  - BB 575 Advanced Genetics and Cellular Biology

  Chemical Engineering
  - CHE 554 Molecular Modeling

  Interactive Media & Game Development
  - IMGD 5000 IMGD Studio
  - IMGD 5010 IMGD Fundamentals
  - IMGD 5100 Tangible and Embodied Interaction
  - IMGD 5200 History and Future of Immersive and Interactive Media
  - IMGD 5300 Design of Interactive Experiences
  - IMGD 5400 Production Management for Interactive Media
  - IMGD 5500 Serious and Applied Games
  - IMGD 5099 Special Topics in IMGD

  Physics for Educators
  - MPE 510 Classical Mechanics
  - MPE 520 Electrodynamics
  - MPE 530 Modern Physics
  - MPE 540 Differential Equations in Nature
  - MPE 550 Computational Methods in Physics
  - MPE 560 Experimental Methods in Physics
  - PH 597 - ST: Physics Education Research Journal Club

  Learning Sciences & Technologies
  - PSY 501 Foundations of the Learning Sciences
  - PSY 502 Learning Environments in Education
  - PSY 504 Meta-Cognition, Motivation, and Affect
  - PSY 506 Learning and Creativity
  - PSY 590 Special Topics in LST

  Science and Technology for Innovation in Global Development
  - DEV 501 Social Innovation and Global Development
  - DEV 502 Design for Social Change
  - DEV 530 Ethics and Social Justice in Science, Engineering, and Development

  Mathematics
  - MA 511 Applied Statistics for Engineers and Scientists
  - MME 522 Applications of Calculus
  - MME 524 Probability & Statistics I

- MME 525 Probability & Statistics II

- ***Research Methods Courses*** (3 credits)
  Candidates in the program will be guided by their STEM Education Center project advisor to enroll in one of the following (existing) research methods courses based on their intended project. The program director will provide information and guidance to determine which courses are offered fully online.
  - CHE 515 Research Analysis and Design
  - DEV 540 Research Methods
  - DEV 550 Policy Evaluation
  - IMGD 5600 Multidisciplinary Research Methods in Computational Media
  - MA 511 Applied Statistics for Engineers and Scientists
  - PSY 507 Applied Multi-Level Modeling
  - SD 550 System Dynamics Foundation: Managing Complexity

- ***Final STEM Project/Thesis*** (6 credits)
  To demonstrate degree qualifications, students will enroll in a culminating project course in the form of Capstone Project (EDU 597), Graduate Qualifying Project (EDU 598), or Thesis (EDU 599). In addition, all students will participate in a required graduate project seminar (EDU 590) at the same time as their project course.

Admissions Requirements

Candidates for this proposed program must have a bachelor's degree and must possess an *initial* teaching license for grades PreK-12 focused on general education, science, mathematics, engineering/technology, computer science, STEM, or similar license. In addition, applicants must be current or future PreK-12 educators (teacher, coach, school/district administrator) working full time in formal or informal settings.

Applications are accepted on a rolling basis. Applicants must submit a Statement of Purpose, identifying how the program will support their professional career goals, as well as 2 letters of recommendation from current or past supervisor in educational setting. Applicants may sign up for individual STEM Education courses without applying to the program.

Program Management

Core Faculty & Staff

Mia Dubosarsky, Kathy Chen, Donna Taylor, Jillian DiBonaventura, Noemi Robertson, TJ Noviello, Anne Ogilvie, Caitlin Keller

Associated Faculty

Francesca Bernardi, Crystal Brown, Jun Dai, Aaron Deskins, Rory Flinn, Neil Heffernan, Mike Johnson, Snehalata Kadam, Rob Kreuger, Erin Ottmar, Oleg Pavlov, Doug Petkie, Michael Radzicki, Stacy Shaw, Scarlet Shell, Gillian Smith, Lisa Stoddard, Izabela Stroe, Xiaoyan (Sherry) Sun.

Steering/Advisory Committee

Mia Dubosarsky, Kathy Chen, Oleg Pavlov, Rory Flinn, Carly Thorp, Jun Dai, Mike Johnson, and Arne Gericke.

Contact/Program Management

Mia Dubosarsky (mdubosarsky@wpi.edu) will serve as the program director and oversee tall academic and administrative aspects of the program.

2. <u>Description of Four New Courses</u>:
to be added to the courses listed in the Graduate Catalog
Proposed New Courses – specific to the MS in Integrated Stem Program:

EDU 590: Graduate Project Seminar (0 credits)
A seminar will be developed and facilitated by the STEM Education Center's members and/or adjunct faculty (with the STEM Education Center) who have extensive research and teaching experience in PreK-12 classrooms. This online synchronous course is intended for students working on their thesis/capstone/graduate qualifying project as part of the MS in Integrated STEM program and will be taken at the same time as their final project/thesis course. The seminar serves as an opportunity for graduate students to share their work and receive feedback and guidance from other students and the instructor. Students will report on the problem/research question, literature review, field-specific professional standards, community members and/or key stakeholders, solution/findings, and discussion.

EDU 597: Integrated STEM Capstone Project (6 credits)
Students enrolled in this online synchronous course complete an individual capstone project for the Integrated STEM program. This course serves as a practical integration of knowledge and skills. Students will define a STEM education related problem within their educational setting (e.g. own classroom, school, after school program), conduct a literature review related to the problem, draw on field-specific professional standards, engage with community members and/or key stakeholders, and propose a solution to the problem that weaves together theory and best-practices related to integrated STEM education. A public presentation is required.

EDU 598: Integrated STEM Graduate Qualifying Project (6 credits)
This graduate qualifying project can be completed individually or in teams, is to be carried out in cooperation with a sponsor or external partner. It must be overseen by a faculty member affiliated with the Integrated STEM program. This offering integrates theory and practice of design for STEM education and should include the utilization of tools and techniques acquired in the program. In addition to a written report, this project must be presented in a formal public presentation to the program's faculty and students.

EDU 599: Integrated STEM Thesis (6 credits)
The online synchronous thesis course consists of an individual research and development project (including action research) advised by a faculty member affiliated with the Program. A thesis proposal must be approved by the Integrated STEM program's advisory committee and the student's advisor, before the student can register for this course. The student must satisfactorily complete a written thesis document, and present the results to the advisor, program's faculty, and students in a public presentation.

List of Other New Courses – <u>specific to several programs including the MS in Integrated Stem Program:</u>
<u>(Note:</u> These course proposals are included in the Consent Agenda of the May 7, 2023 faculty meeting)

EDU 500 – Foundations of Integrated STEM Education
EDU 510 – Classroom Climate that Supports Diverse STEM Learners
EDU 520 – STEM & Project Based Learning Curriculum
EDU 530 – Performance Assessments in STEM Education
EDU 540 – Informal STEM Education
EDU 550 – Collaboration & Teamwork in STEM Education
EDU 580 – Special Topics in Integrated STEM Education

Rationale:

Overview

The Master's in Integrated STEM Education will bring together WPI's strengths in theory & practice as well as innovative models for teaching STEM through PBL. For over 50 years WPI's curriculum emphasizes the application of learning and the impact on communities around the globe. For over a decade, the STEM Education Center has been a leader in supporting PreK-12 educators through STEM & PBL professional development and education research. The proposed program will build on the Center's extensive experience and recognition, sealed by WPI's superb courses to grant PreK-12 educators with a desired graduate degree and career advancement.

This **blended program**, which can be taken fully online synchronously or as a combination of online & in-person courses, will appeal to the national population of PK-12 educators, who are looking to advance their knowledge while having practical components to immediately use in their classroom. In many US states, newly certified teachers are required to complete a master's degree within a limited time of their initial certification (e.g. 5 years in MA). These **teachers are looking for programs that tie together content knowledge with classroom applications, guided by experienced educators with expertise in both content and classroom pedagogy**. Most programs exist in a collect of education and do not offer the STEM focus that WPI can uniquely provide in a PBL environment.

The proposed master's program will be **coordinated by the STEM Education Center**, whose members will develop and facilitate the pedagogy courses, in collaboration with several WPI departments that will accept candidates into existing graduate courses. Candidates will complete 3 core courses in STEM education pedagogy, as well as 4 elective courses from existing programs at WPI, including Learning Sciences & Technologies, Master of Mathematics for Educators (MME), Master's in Physics for Educators (MPED), Interactive Media and Game Development (IMGD), and more. Finally, candidates will complete a capstone project in which they research and design solutions to a real-world problem related to STEM education.

In its second phase, the program will add a licensure component that will enable students from WPI and other universities, as well as career changers who are interested in earning a teaching license in one of the STEM fields. The licensure component includes pedagogy courses, sheltered English immersion (SEI) course, and a supervised practicum in a middle/high school. In order to have an approved teacher licensure graduate program, WPI (STEM Education Center) would need to go through a formal application process with the State.

Lastly, if approved, this program will leverage research opportunities related to STEM teacher leadership, for example the NSF Robert Noyce Teacher Scholarship Program (Track 3: The NSF Master Teaching Fellowships,) which supports graduate degrees for educators teaching in high needs school districts (such as Worcester & Fitchburg) with up to $3,000,000, with a duration of up to 6 years.

Support

The US is facing a dire shortage of middle- and high-school qualified STEM teachers [1,2], estimated at 180k-350k [3], due to lack of preparation and turnover. Higher education has an important role and responsibility in preparing and supporting PreK-12 educators with deep content knowledge and STEM pedagogy. **This proposed program will address an 'untapped' population of potential graduate students seeking graduate degrees at other universities.** The program will work in synergy with other MS for educators on campus (MPED, MME) to enhance all programs and provide some shared pedagogy courses.

The Needs of Current PreK-12 Educators. In many states, a professional teaching license requires a master's degree. In Massachusetts, teachers start their career with an initial teaching license, and are required to complete a master's degree that includes courses in disciplinary content and pedagogy within 5 years. In addition, MA teachers are required to complete 150 hours of professional development (PD) every 5 years (in both content and pedagogy) in order renew their license. Lastly, teachers in some districts are looking for stand-alone graduate courses for reasons related to salary, course reimbursement, and the fact that graduate courses provide a sizable number of PD hours at once. A survey conducted by the STEM Education Center with current PreK-12 educators (N=20) revealed a variety of reasons that may lead them to enroll in this proposed program, including the development of knowledge & practice around the teaching of STEM, applying to a new position at their school, and better serving their diverse students in STEM classrooms. Only 1% of responders did not see a need for such a program. **The proposed program will support current PreK-12 educators with all 3 identified needs: Professional Development hours, stand-alone graduate courses in STEM pedagogy, and a full MS program.**

Convergence Education as a Framework for Integrated STEM Education.

*"**Convergence education** is driven by compelling or complex socio-scientific problems or topics, where learners apply knowledge and skills using a blended approach across multiple disciplines (i.e., transdisciplinary) to create and innovate new solutions."* [4, p.7]

Convergence STEM education is an opportunity to solve complex global problems, through the development of content knowledge, STEM identity, and 21st century skills. However, PreK-12 teacher education and professional advancement programs are often disciplinary-focused and do not emphasize pedagogical skills to better meet the demands of transdisciplinary learning experiences. **Researchers and policy makers call on Institutes of Higher Education** to develop and offer courses for future and current teachers that embrace transdisciplinary and convergence education [4]. These should specifically provide the opportunity for teachers to gain experience blending learning across disciplines to solve compelling socio-scientific problems to ensure STEM confidence and identity in educators.

WPI is well positioned to become a leader in convergent STEM Education. The WPI undergraduate experience and PBL approach, as well as several interdisciplinary graduate programs embody the desired integrative nature identified in the reports. In addition, WPI's commitment to quality PreK-12 education and educators is evident and appreciated by educators. Two graduate programs designed for in-service PreK-12 educators already exist at WPI (MME, MPED) and a special tuition discount for teachers makes WPI's graduate programs competitive and affordable to full time teachers. In addition, the STEM Education Center (established in 2012) is recognized for its quality in delivering high quality STEM professional development workshops and courses, and leading education research.

The STEM Education Center at WPI is committed to empowering educators to create relevant, integrated, and inclusive STEM learning experiences with their students and communities. Since it was established in 2012, the STEM Education Center has engaged more than 7,500 educators with interactive STEM-focused workshops in 15 States and across 3 Continents. As a Massachusetts Department of Elementary and Secondary Education (DESE) approved PD provider, the Center's professional development (PD) programs follow cooperative learning pedagogy and align with DESE's 10 standards for high quality professional development.

Through multiple grant programs (NSF, IES, MA Dept. of Education) the STEM Education Center connects faculty with PreK-12 educators, supporting transdisciplinary approaches to teaching STEM education and allowing faculty to understand the specific needs of PreK-12 classrooms, schools, and districts. All affiliated

faculty (see p' 8) have experience working with and teaching PreK-12 educators (in current courses and/or research labs).

We have reviewed over 40 graduate programs identified as STEM/STEAM education but could not find an online program that embodies the transdisciplinary nature (data summary in section 7d, full data can be shared upon request). **This positions WPI to become a recognized leader in Integrated STEM Education among PreK-12 educators**.

Capacity to Lead High-Quality Professional Development (PD) Programs. **The STEM Education Center's PD work** focuses on supporting PreK-12 educators, administrators, and community members. We design and facilitate customized PDs for schools/districts, as well as design general programs that are open to all educators. We also develop PDs in collaboration with other entities, including Massachusetts Department of Elementary & Secondary Education (DESE) and WPI faculty. Several WPI faculty include PreK-12 outreach in their proposals, particularly the NSF CAREER proposal, and the STEM Education Center supports the development of PD workshops for PK-12 teachers that dissemination of research, inspire teachers and students, and support the creation of a broader impact of their research. This scope of work allows us to connect with (and learn from) educators about their specific STEM education needs. During fiscal year '23 the Center developed and facilitated **26 unique programs** over **96 days**, totaling **more than 400 hours** of PD workshops (both in-person and remotely). The vast majority of educators served are from Massachusetts (~95%) but we also serve teachers from other states.

Educators consider the Center's PD programs to be of high quality. FY22 participants rated our PDs as excellent (**4.6/5**), commenting on the interactive nature of the workshops, the opportunity to collaborate with other educators, the different modalities and variety of tasks and tools, the organization of course materials, and the knowledge and expertise of the facilitators.

The Center was selected as a PD partner with several DESE programs, including the Science and Math Ambassadors (2018-19), Innovative Assessments (2021-24), and OAPL Science (2022-24). Through these DESE funded statewide programs, we were able to learn more about the state of STEM education across the state.

Lastly, to address PK-12 educators multiple needs, a cost-effective model calls for offering courses that can be taken for either PD hours or graduate credits (with additional academic tasks and registration fees). **The STEM Education Center already offers courses that can be taken for continuing education or graduate credits, and the administrative path to multi-tiered registration is established**.

Additional student population. The proposed program will also serve current WPI students. **Undergraduate students** enrolled in the **teacher preparation program (TPP)**, who graduate with an initial teaching license (in addition to their disciplinary STEM degree), may be interested in working toward a master's degree they could apply towards a *professional* teaching license. WPI **graduate students** enrolled in master's programs such as MME, MPED, Learning Sciences & Technologies, and others, can synergistically take courses in STEM education pedagogy as electives that complement their core courses. Currently, physics teachers enrolled in the Masters in Physics for Educators (MPED) complete some of the required pedagogy courses at state universities, as required courses are not offered at WPI on a regular schedule. The distinguishing feature of the WPI master's for PreK-12 educators is that graduate STEM disciplinary courses are part of the program, unlike most Master's for Teaching (MAT) programs that focus on education.

Later phase: Licensure. During a future phase of the program, a licensure component will be added, in which STEM professionals would be able to attend a methods course and teaching practicum and get their

license to teach STEM subjects in schools. These could be WPI graduates who didn't enroll in the undergraduate TPP, or other career changers.

Resources Required:
At its core, the MS in Integrated STEM will rely on **existing** personnel, registration systems, and academic structures/offerings already existing at WPI. However, some personnel and technology resources are required for the successful delivery of the program:

Personnel: Faculty and instructors at the STEM Education Center will be responsible for developing and facilitating core courses (and some have already been taught as special topics grad courses). Teaching these courses will be in load for STEM Education Center's personnel. If needed, adjunct instructors who worked as PreK-12 educators will be hired and paid by the STEM Education Center to assist with course instruction and/or project advising.

Administration: All core courses of the proposed program will be designed to support multi-tiered registration (catering to teachers' needs and wishes) – professional development hours, grad courses, or degree program. The registration structure is already in place (and has been tested before). Marketing and recruitment will rely on existing structures at graduate admissions, and the STEM Education Center.

Technology support: The program is offered in a blended format, with the core courses, project seminar, and some elective courses offered synchronously online. Therefore, an institutional Zoom pro account is needed. Please note that a Canvas site will **not** be used for core courses, as teachers who are taking the course for professional development do not have access to Canvas. The STEM Education Center relies on other tools (such as Padlet, Google) for the different course activities. An annual membership is already paid by the Center.

Essentially, no new resources are required by WPI – the work of the STEM Education Center slightly shifts to incorporate a Masters program and will bring additional value to WPI and PreK-12 STEM educators.

Projected number of candidates and revenue
A ***conservative calculation*** projects growing the number of enrolled students from 4 to 20 within 5 years. Based on data provided from the Massachusetts Department of Elementary and Secondary Education (DESE), about 380 students receive their initial license to teach STEM subjects (mathematics, computer science, general science, biology, chemistry, physics, earth science, and engineering technology). Even if we assume that only half of them will seek their master's degree, WPI with its excellent reputation in STEM education (both content and pedagogy), would be able to support 10% of these local educators. Since the program will be offered virtually, we could attract candidates from outside of Massachusetts.
The small number of students will not add a heavy burden on existing graduate courses. With a large amount of associated elective content and research methods courses, each course may see an increase of 0-2 students.

Table C: Projected Revenue Generated Across 5 Academic Years

	'24-'25 AY	**'25-'26 AY**	**'26-'27 AY**	**'27-'28 AY**	**'28-'29 AY**
Projected number of newly enrolled students in MS program	**4**	**8**	**12**	**16**	**20**
# of educators enrolled for PD only in core courses	36	48	48	48	48
Projected revenue from PD registration* (no academic credit)	$24,840	$33,120	$33,120	$33,120	$33,120
Projected revenue from graduate course registration** (both core & elective courses)	$24,000	$72,000	$132,000	$180,000	$240,000
Total revenue	**$48,840**	**$105,120**	**$165,120**	**$213,120**	**$273,120**

* Note: calculating based on 12 educators who register for the course for PD/CEU only

** Notes:

1. assuming each educator in the program complete on average 4 courses during each AY
2. the discounted rate of graduate tuition for full-time educators is $500 per credit.

Program Assessment

a. Impact on existing programs at WPI

The proposed program is expected to enhance existing WPI programs, and especially the ones that are focused on PreK-12 educators (i.e., MPED, MME). As described above, the population of PreK-12 educators who are looking to get their MS degree to advance to *professional* license is untapped by WPI. Unlike existing MS courses in content areas, these teachers are not looking to become researchers, but rather enhance their content and pedagogical knowledge about teaching key concepts to their PreK-12 students, as well as advance their professional progression.

Some existing grad programs that are of interest to educators (MPED, MME, MMED, LST) have a small number of enrolled graduate students. Offering these courses as part of a new MS will enhance the number of courses participants, as well as enrich the academic experience, without any additional cost to WPI. The proposed MS in Integrated STEM is expected to increase the number of students in existing graduate courses in various departments (Table B) and would not require additional resources.

b. Comparison to existing programs at WPI

The proposed program will enhance and support other educators' programs at WPI. A new Graduate Certificate in Teaching Cyber Security for High School Teachers is under development as a fully online program for educators (with initial grant funding). These educators may be interested in completing 6 additional courses for a full master's degree from WPI. The MME & MPED grad programs currently have a limited number of teachers, and some of the MPED candidates take pedagogy courses at other universities due to the lack of applicable courses at WPI. Both programs shifted to a hybrid model, seeing

interest from educators as far as Hawaii. The proposed STEM Education core courses could support and enhance the MME and MPED programs, providing their students applicable online courses at WPI, and the opportunity to discuss STEM pedagogy with fellow educators in multiple fields of study. In addition, the proposed program could bring additional participants to MME and MPED courses, which are listed as electives. All programs for educators will offer the same tuition discount for full time educators.

c. *Comparable programs at other universities*
We have reviewed over 40 graduate STEM programs for educators at other universities in the US (full data available upon request) and conclude that the proposed program will be an attractive offering tao US educators. Here is a summary of the existing programs:

- Host Department: 91% of the 40 programs that were reviewed are in education departments, compared to only 9% of programs hosted by a science, math, or engineering department. WPI does not have a traditional education department found at many universities, and instead has the STEM Education Center with expertise in PreK-12 STEM education.
- Tuition: The tuition of the 40 reviewed programs ranges from $5,000-$50,000. The mean for in-state tuition is $18,258 & out-of-state tuition is $21,451; and the mode tuition is ~ $15,000. The proposed degree would be $15,000 with the special discount offered by WPI to full-time educators, making our proposed program compatible and attractive.
- Format: 19% of the 40 programs require teachers to attend in-person classes, 35% offer online only courses, and 46% offer a hybrid/blended format. Our proposed program will follow a blended model, in which candidates can choose between taking courses online (may suit non-local educators), or combining online & in-person courses, thus increasing access to a wide audience of educators nationwide. All EDU courses, and some of the elective and research methods courses will be offered online (synchronously). The majority of existing elective & research methods courses are offered in-person, expanding the variety of offerings to local educators.
- Program Duration: Most of the programs allow educators to complete them within 12-24 months. Our program could be completed within 15-30 months, providing educators with the flexibility of completing the program at a slower pace.

Endorsements Across WPI

- Interactive Media and Game Development
- Mathematical Sciences
- Physics
- Social Sciences and Policy Studies
- Dean of Undergraduate Studies

Implementation timeline: This program is expected to launch in the 2024-2025 academic year, upon faculty approval. Two core courses are already being offered as special topics courses, and during the ’24-’25 AY, two additional courses will be developed and offered. The last 2 core courses will be developed and offered during the ’25-’26 academic year. In all, the STEM Education Center will offer 4 core courses each academic year, two courses during the summer, one course during the fall semester, and one course during the spring semester.

References:

1. Feder, T. (2022). The US is in dire need of STEM teachers. Physics Today, 75(3), 25-27.
2. Hutchison, Laveria F. "Addressing the STEM teacher shortage in American schools: Ways to recruit and retain effective STEM teachers." Action in Teacher Education 34, no. 5-6 (2012): 541-550.
3. Marder, M. (2021). How bad is the US STEM teacher shortage. Available at: https://uteachinstitute.medium.com/u-s-stem-teacher-shortages-in-2017-2018-1d8314a93ba1
4. National Science & Technology Council (2022). Convergence Education: A Guide to Transdisciplinary STEM Learning and Teaching. Available at: https://www.whitehouse.gov/wp-content/uploads/2022/11/Convergence_Public-Report_Final.pdf

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to establish an MS degree, and BS/MS and Graduate Certificate programs in Explosion Protection Engineering

Motion: On behalf of the Departments of Fire Protection Engineering, Chemical Engineering, Aerospace Engineering, and Mechanical and Materials Engineering, the Committee on Graduate Studies and Research recommends, and I move that an MS degree, a BS/MS program, and a Graduate Certificate program in Explosion Protection Engineering be established, as describedbelow.

Description of the Proposed Program – to be included in the WPI Graduate Catalog:

Goal
The goal of the Master of Science program in Explosion Protection Engineering is:

- To incorporate current standards of practice and modern theories into education
- To conduct research to develop new knowledge, and to improve methods of application of that knowledge
- To identify technology in other disciplines that is appropriate for explosion safety and to achieve a proper transfer (translation) of that technology
- To help define the discipline of explosion protection engineering

Degree requirements
The M.S. program in Explosion Protection Engineering (XPE) requires 30 credit hours of work. Students may select a thesis option which requires a 9 credit thesis or a non-thesis option, which requires selection of elective courses, to fulfill the credit requirement.

Table 1: Course structure for XPE.

Category	Subcategory	Course Options	Credits
Core	Foundational	FP 580 (3 credits) or AE 5233 (2 credits): Combustion	2-3
		FP 585: Explosion Dynamics	3
		AE 5131: Incompressible Fluid Dynamics (2 credits) **or** CHE 571: Transport Phenomena (3 credits) **or** ME 514: Fluid Dynamics (3 credits)	2-3
		AE 5132: Compressible Fluid Dynamics (2 credits)	2-3
	Evaluation	FP 575: Explosion Protection	3
		FP 582: Quantitative Risk Analysis	3
Engineering Context	Forensics	FP 572: Failure Analysis	3
		FP 580: Forensic Techniques	3
	Modeling	ME 5108: Introduction to Computational Fluid Dynamics (2 credits) **or** FP 520: Fire Modeling (3 credits)	2-3
Electives or Thesis Option	Electives	See Non-Thesis Option (Electives)	6
	Thesis Option[1]	See MS Thesis Option	9

[1] One Engineering Context course can be dropped by the student pursuing an MS thesis.

All entering students must submit a plan of study identifying the courses to be taken and a prospective project topic before the end of the first semester in the program. The plan of study must be approved by the student's advisor and the XPE Graduate Program Committee, and must include the following minimum requirements. Table 1 shows a summary of the courses subdivided into three categories Core, Engineering Context, and Electives. Table 2 provides the credit requirement for BS/MS and MS (thesis and non-thesis) degrees.

Non-Thesis Option (Electives)
Sufficient course work selected from courses at the 500 level or above with a prefix of FPE, AE, ME, CHE, CE, to total 30 credit hours. Courses at the 4000 level may also be taken as electives with the prior approval of the XPE Graduate Committee. Some examples of Elective Courses are: FP 573: Industrial Fire Protection, CE 511: Structural Dynamics, and FP 588 Practical Explosion Analysis: Case Studies in Energy Industry.

MS Thesis Option
The M.S. thesis consists of 9 credit hours of work, normally spread over at least one academic year. One Engineering Context course can be dropped by the student pursuing an MS thesis. A thesis committee will be set up during the first semester of thesis work. This committee will be selected by the student in consultation with the major advisor and will consist of the thesis advisor, who must be a full-time WPI faculty member, and two other faculty members, at least one of whom is a WPI FPE faculty member, whose expertise will aid the student's research program. An oral presentation before the Thesis Committee and a general audience is required. In addition, all WPI thesis regulations must be followed.

BS/MS in Explosion Protection Engineering
The requirements for the proposed M.S. in XPE are structured so that undergraduate students would be able to pursue a five-year Bachelors/Masters program, in which the Bachelors degree is awarded in any major offered at WPI and the Masters degree is awarded in XPE Engineering.
WPI allows the double counting of up to 12 credits for students pursuing a 5-year Bachelors-Masters program. This overlap can be achieved through the following mechanisms:

- Up to three graduate courses in FPE, CHE, CE, AE, ME taken by the student may be counted towards meeting the engineering/science/elective requirements of the student's undergraduate major, subject to approval by his/her major department.
- Up to two 4000-level undergraduate courses taken by the student in his/her undergraduate major program may be counted towards the requirements of the Masters Degree in XPE if they can be placed in one of the requirement categories listed above and are approved by the XPE Graduate Program Committee.

Table 2: Credit Requirements for XPE

	MS Thesis	**MS Non-Thesis**	**BS/MS**
Explosion Core	15	15	15
Engineering Context	6	6	6
Electives	0	9	9
Thesis	9	–	–
Double Count	–	–	(12)
Total	30	30	18

Graduate Technical Certificate in Explosion Protection Engineering (9 credits)
This option is available for professionals wanting to hone their skills in a particular area. A graduate technical certificate can comprise of a choice of 3 courses:

1. Explosion Dynamics, FP 585
2. Evaluation course in Core (Table 1): FP: 575 – Explosion Protection or FP: 582- Quantitative Risk Analysis
3. Engineering Context course (Table 1) or FP 588 Practical Explosion Analysis: Case Studies in Energy Industry.

Elective courses are not allowed. In special cases, where the student is interested in studying a practical industry specific XPE problem, a three credit Independent Study that is approved by the XPE Program Director will be considered as one course.

Admission Requirements

Students will be eligible for admission to the program if they have earned an undergraduate degree in Fire Protection Engineering, Chemical Engineering, Aerospace Engineering, Civil Engineering, Environmental Engineering, Mechanical Engineering or a related field from an accredited university consistent with the WPI graduate catalog. Students with a degree in Physics and Mathematics are also eligible. Admission will also be open to qualified WPI students who opt for a five-year Bachelors-Master's program, with the undergraduate major in above or related fields. Admission decisions will be made by the XPE Graduate Program Committee based on all of the factors presented in the application.

Students applying to the M.S. Degree in XPE are expected to have a bachelor's degree in related areas in Engineering or Science. A strong applicant who is missing background coursework as needed for course requirements may be admitted, with the expectation that he or she will take and pass one or more undergraduate courses in this area of deficiency either during the summer prior to admission or within the first semester after admission. These remedial courses will not count towards meeting the M.S. degree requirements. The determination of what course or courses will satisfy this provision will be made by the XPE Faculty Advisory Committee, which consists of faculty members from the participating departments at WPI. No GRE scores are needed. An English language test may be required for international students. See international student admission requirements for more information.

Transfer Credit

A student may petition for permission to use graduate courses taken at other institutions to satisfy XPE graduate degree requirements. A maximum of ~~12~~ 9 graduate credits, with a grade of B or better, may be satisfied by courses taken elsewhere and not used to satisfy degree requirements at other institutions. Petitions are subject to approval by the XPE Graduate Committee, and are then filed with the Registrar. Transfer credit will not be allowed for undergraduate-level courses taken at other institutions. In general, transfer credit will not be allowed for any WPI undergraduate courses used to fulfill undergraduate degree requirements; however, note that there are exceptions in the case of students enrolled in the BS/MS program. No class can be triple counted.

A student with one or more WPI master's degrees who is seeking an XPE master's degree from WPI may petition to apply up to 9 prior credits toward satisfying requirements for the subsequent degree. Petitions are subject to approval by the XPE Graduate Committee.

Students who take graduate courses at WPI prior to formal admission to the XPE graduate program may petition to apply up to 9 graduate credits to fulfill the XPE graduate degree requirements. Once again, petitions are subject to approval by the XPE Graduate Committee.

Sample Plans of Study

4 semester option (Thesis)

Semester 1	Semester 2	Summer	Semester 3	Semester 4
Combustion (FP 580)	Quantitative Risk Analysis (FP 582)	Failure Analysis (FP572)	Explosion Protection (FP 575)	Intro to CFD (ME5108) Or Fire Modeling (FP520)
Explosion Dynamics (FP 585)	Directed Research		Directed Research	Directed Research
	Fluid Dynamics (ME 514) Or T Phenomena (CHE 571) Or AE 5132: Compressible Fluid Dynamics (2 credits)			
6 credits	9 credits	3 credits	6 credits	6

3 semester option, Non Thesis

Semester 1	Semester 2	Summer	Semester 3
Combustion (FP 580)	Explosion Protection (FP 575)	Failure Analysis (FP572)	Intro to CFD (ME5108) or Fire Modeling (FP520)
Explosion Dynamics (FP 585)	Quantitative Risk Analysis (FP 582)	Forensic Techniques (FP 580)	Elective Course
Elective courses from Table 1	Fluid Dynamics (ME 514) Or T Phenomena (CHE 571)		
9 credits	9 credits	6 credits	6 credits

4 semester option Non Thesis

Semester 1	Semester 2	Summer	Semester 3	Semester 4	Summer
Combustion (FP 580)	Quantitative Risk Analysis (FP 582)	Failure Analysis (FP572)	Explosion Dynamics (FP585)	Explosion Protection (FP 575)	Forensic Techniques (FP 580)
Explosion Dynamics (FP 585)	Fluid Dynamics (ME 514) Or T Phenomena (CHE 571)		Elective Course	Intro to CFD (ME5108) or Fire Modeling (FP520)	
6 credits	6 credits	3 credits	6 credits	6	3

Faculty

This is a joint program administered by the Fire Protection Engineering, Aerospace Engineering Chemical Engineering, and Mechanical Engineering comprising faculty members who are interested in Explosion Protection graduate education and research and who hold advanced degrees. The three programs will share director and associate directors, with the FPE department being the host department for the program.

----------END of Proposed Modifications to Graduate Catalog----------

Listing/Grouping of the Relevant Courses:
All courses are offered once/year with an online component.

Part 1 – Core Courses:
The core courses (1 – 6) are divided into foundational courses necessary to study Explosion Protection Engineering and evaluation courses that bridge the gap between engineering codes and standards and fundamentals.

1. FP 580: Combustion (ME/FPE) (Foundational) - *Credits: 3*

   OR

   AE 5233: Combustion (Foundational) - *Credits: 2*

2. FP 585: Explosion Dynamics (Foundational) - *Credits: 3*

3. AE 5131: Incompressible Fluid Dynamics (Foundational) - *Credits: 2*

   OR

   CHE 571: Transport Phenomena (Foundational) - *Credits: 3*

   OR

   ME 514: Fluid Dynamics (Foundational) – *Credits: 2*

4. AE 5132: Compressible Fluid Dynamics (Foundational) - *Credits: 2*
5. FP 575: Explosion Protection (Evaluation) - *Credits: 3*
6. FP 582: Quantitative Risk Analysis (FPE) (Evaluation) - *Credits: 3*

Part 2 -Engineering Context:
The Engineering Context courses (7 – 9) will function to approach problems from an industrial explosion protection engineering perspective. All courses are practice oriented and provide the students tools and skill sets that industrial practitioners are looking for.

7. FP 572: Failure Analysis – Credits: 3
8. FP 580: Forensic Techniques - Credits: 3
9. ME 5108: Introduction to Computational Fluid Dynamics - Credits: 2

   OR

   FP 520: Fire Modeling - Credits: 3

Part 3 –Electives
(Some examples 10-12)

10. CE 511: Structural Dynamics: - Credits: 3
11. FP 573: Industrial Fire Protection: - Credits: 3
12. FP 588 Practical Explosion Analysis: Case Studies in Energy Industry - Credits: 3

13. Graduate Thesis: A 9-credit thesis can replace 6 credits of elective course work and 3 credits of Engineering Context Course work. The graduate thesis involves creating and advancing a comprehensive

explosion 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 will be presented to the steering committee that comprises of industry.

Rationale:

Opportunities and Market Analysis

There is no program like the one proposed in the US. There are some schools with programs in Chemical Process Safety that offer one course related to explosion safety, but it is usually clubbed with fire safety and does not cover fundamentals or applied concepts in the breadth and depth that we are proposing. This will be the **first program ever** in US and maybe even the world.

- Missouri Science and Tech U. has a MS program on Explosives Engineering. https://mee.mst.edu/degrees/masters-degree-in-explosives-engineering/
  They claim to be the only one in the nation. However, their emphasis is on condensed phase explosives and pyrotechnics used in mining.
- The Mary Kay O'Connor Process Safety Center at Texas A&M University offers a graduate certificate in Process Safety Engineering. The program covers topics such as hazard identification, risk assessment, and explosion protection.
- The University of Wisconsin-Madison offers a certificate in Process Safety and Risk Management. This program includes courses on explosion protection, process safety management, and risk analysis.
- Oklahoma State University offers a graduate certificate in Process Safety, which includes courses on explosion protection, risk assessment, and process safety management.
- The American Institute of Chemical Engineers (AIChE) offers a Process Safety Boot Camp, which covers topics such as process hazard analysis, incident investigation, and explosion protection.
- The National Fire Protection Association (NFPA) offers several professional development courses related to explosion protection, including courses on dust hazard analysis, explosion protection systems, and hazardous materials

Worldwide, there are some programs, again related to chemical process safety, that offer certificates

- University of Sheffield, UK: The Department of Chemical and Biological Engineering offers a Master of Science (MSc) in Process Safety and Loss Prevention. The program includes a module on explosions and covers topics such as hazard identification, risk assessment, and explosion protection.
- University of Leeds, UK: The School of Chemical and Process Engineering offers a Master of Science (MSc) in Process Safety and Risk Management. The program covers topics such as explosion protection, risk analysis, and safety culture.
- Lund University, Sweden: The Division of Fire Safety Engineering offers a Master of Science (MSc) in Fire Safety Engineering. The program includes modules on explosion safety and covers topics such as explosion prevention, protection, and mitigation.
- University of Stavanger, Norway: The Department of Mechanical and Structural Engineering and Materials Science offers a Master of Science (MSc) in Risk Management and Societal Safety. The program includes a module on explosion safety and covers topics such as risk assessment, safety management, and explosion protection.
- University of Bergen, Norway: The Department of Physics and Technology offers a graduate course on Explosion Hazard in the Process Industry and a course on Combustion Physics.

Across diverse economies, a surge in demand for explosion protection expertise paints a promising picture for international students considering a Master's program in this dynamic field. Here's a snapshot of the global landscape, showcasing significant job growth and competitive salaries:

- US: As a benchmark, the US saw a +16% growth in explosion protection job postings compared to +10% for fire protection engineering (Indeed, Jan 2023 - 2024). Average salaries for explosion protection specialists sit at $92,000 compared to $88,000 for fire protection engineers.
- India: Explosion protection specialist job postings skyrocketed by +25% on Indeed (Jan 2023 - 2024), fueled by chemical processing, energy production, and other explosion-prone industries. With an average salary 20% higher than fire protection engineers, this specialization commands a premium.
- Middle East: Petrochemical and energy sectors witnessed a remarkable +30% growth in explosion protection job postings, echoing India's trend. A report by Global Market Insights predicts the region's chemical explosives market to reach $7.7 billion by 2027, further highlighting the expertise demand.
- China: Boasting a +22% increase in explosion protection job postings compared to the US (Indeed, Jan 2023 - 2024), China's industrial expansion continues to drive demand. Additionally, China's focus on renewable energy like hydrogen fuel cells accentuates the need for managing these emerging explosion risks.
- Mexico and Brazil: These Latin American giants saw a steady +16% and +14% increase in explosion protection job postings, respectively (Indeed, Jan 2023 - 2024). Chemical manufacturing, mining, and oil and gas sectors fuel this growth, offering international graduates promising career opportunities.
- Canada: Committed to natural resources and renewable energy, Canada maintains a steady demand for explosion protection specialists. Job postings climbed by +12% on Indeed (Jan 2023 - 2024), with salaries topping $100,000 in some regions (depending on experience).
- Europe and UK: Despite mature economies, Europe and the UK continue to seek specialists for chemical manufacturing, energy production, and mining. Job postings remained stable between +5% and +8% (Indeed and Glassdoor), with salaries exceeding $90,000 in many cases.
- Australia: Mining and resources sector expansion led to a +15% increase in explosion protection job postings on Indeed (Jan 2023 - 2024). Top job board Seek reveals salaries often exceeding $120,000 for these professionals.
- Nigeria: Diversifying beyond oil, Nigeria's chemical manufacturing and food processing sectors witnessed a +18% increase in explosion protection job postings on Indeed (Jan 2023 - 2024), demonstrating promising career paths for graduates with this expertise.

A Chemical Processing magazine article (CEP May 2023) highlighted the increasing pressure on chemical plants to invest in advanced explosion protection technologies, creating demand for skilled specialists. A recent Financial Times report (October 2023) discussed the growing concerns about battery fire hazards in electric vehicles, emphasizing the need for explosion protection expertise in this rapidly evolving sector.

Why Now?

There is a growing demand for experts in explosion protection, particularly in industries such as oil and gas, chemical production, and mining. According to a report on Yahoo Finance, the global explosion protection market (manufacturers' of explosion isolation, venting, and suppression equipment) was valued at $5.3 billion in 2018 and is expected to grow at a compound annual growth rate (CAGR) of 6.8% from 2019 to 2030. This indicates that there is a significant need for professionals with expertise in explosion protection. The earnings potential for graduates with an MS in Explosion Protection varies depending on the industry and location. However, according to data from Payscale.com, the average salary for an individual with expertise in explosion protection ranges from $70,000 to $130,000 per year, depending on the specific job title and level of experience.

Delving into specific sectors and regions significant risks and potential losses are associated with explosions. This opens up a pathway for an Explosion Protection Program.

- Chemical Industry: According to the U.S. Chemical Safety Board, between 2013 and 2023, there were 31 major chemical accidents in the US alone, with explosions accounting for nearly a third of these incidents. These explosions resulted in 50 fatalities and hundreds of injuries.
- Oil and Gas Industry: Pipeline and facility explosions in the oil and gas sector frequently lead to large economic losses and environmental damage. For instance, the Deepwater Horizon oil spill in 2010 caused an estimated $65 billion in cleanup costs and environmental damages.
- Transportation Accidents: While not all transportation accidents involve explosions, those involving fuel tankers, hazardous materials trucks, and battery-powered vehicles can have devastating consequences. The National Highway Traffic Safety Administration reports that an average of 184 people died in crashes involving large trucks transporting flammable liquids every year between 2013 and 2021.
- The landscape of lithium-ion battery risks is rapidly evolving, raising concerns across diverse sectors. In energy storage, incidents like the April 2019 Surprise, AZ explosion at a large-scale facility and multiple fires in California highlight the critical need for robust safety measures and skilled professionals to manage these systems. The electric vehicle industry faces similar challenges, with recalls and investigations prompted by spontaneous fires in Hyundai Kona EVs (multiple incidents) and Tesla Model S/X vehicles. Even seemingly ubiquitous devices like laptops and phones aren't immune, with the infamous Samsung Galaxy Note 7 battery explosions in 2016 serving as a stark reminder of the potential dangers. These incidents underscore the urgent need for advancements in explosion protection expertise, stricter regulations, and public awareness about battery safety – a challenge demanding immediate attention across a broad spectrum of industries.
- As part of Bipartisan infrastructure law (build.gov) US DOE will be investing $8 Billion in hydrogen hubs and $1 Billion in Hydrogen electrolysis programs. These massive investments will lead to significant explosion safety hazards and consequently require engineers with new skill sets and training to be prepared to handle such massive change in infrastructure.
- The commercial space industry accounts for more than $330 billion per year worldwide. The Government spending is $77 Billion. Explosion safety in a space environment (Lunar gravity, Martian gravity and zero gravity) is an unexplored area of research. All accidents in space to date have been related to an explosion. Human spaceflight explosion safety is a significant concern.
- As renewable energy usage increases, new sources of energy that are high density type of applications like Battery and Hydrogen gas. These pose explosion hazards and not fire hazards. The ignition potential of methane (natural gas) varies between 0.09 and 0.11, while hydrogen had an ignition potential between 0.15 and 0.42. Incidents due to material corrosion or degradation with a closed kitchen door where methane is the heating fuel used has an ignition potential of 0.1, while hydrogen is at at 0.17 to 0.31, depending on the sensitivity case. This represents a four-fold increase in ignition potential compared to methane. Following the same trend, the domestic explosion risk for hydrogen heating systems is over four-times higher compared to natural gas systems. (Source: Statista)

Potential challenges or risks

While the launch of the Master of Explosion Protection Engineering program at WPI presents a unique opportunity as the first of its kind in the United States, it is prudent to anticipate potential challenges that may arise in the future.

Competition from Other Universities:

As the program gains recognition and success, the potential for competition from other universities may emerge in the coming years. However, WPI's commitment to maintaining the highest standards of education, its distinguished faculty, and the establishment of a solid foundation in the field will position the program as a leader. The continuous enhancement of courses, ongoing collaboration with industry experts, and a focus on cutting-edge research will ensure that the WPI program remains at the forefront of explosion protection education.

Need for Specialized Equipment and Facilities:
Explosion protection engineering may require specialized equipment and facilities for hands-on experiential learning. WPI is well-equipped to address this challenge with the existence of the Combustion Laboratory (https://combustionlab.wpi.edu/). This state-of-the-art facility, equipped with cutting-edge technology and instrumentation, provides a controlled environment for studying combustion processes. Notably, the lab includes a Class 2 Div 2 space, meeting explosion-proof standards. Leveraging this existing resource will serve as a valuable launch pad for teaching novel courses and conducting groundbreaking research in explosion protection.

Furthermore, WPI's strategic location is advantageous, with proximity to the FM Global Research Campus in Rhode Island. This campus houses dedicated Explosion Labs and serves as an additional resource for specialized equipment and collaboration opportunities. WPI's Fire Protection Engineering department's longstanding ties with FM Global, along with our alumni already engaged in impactful work there, will strengthen the program's connection to industry needs and ensure a rich learning experience for students.

Uncertainty of Industry Funding in the Long Term:
The reliance on industry funding for research projects and collaborations may pose a potential long-term challenge due to economic fluctuations or changes in industry priorities. The program will be committed to diversifying funding sources, seeking government grants, and establishing an alumni network that can contribute to sustaining the program's research initiatives.

Another proposed strategy is the establishment of an annual conference hosted at WPI, bringing together industry leaders, academics, and professionals in the field of explosion protection. This conference will aim to create a platform for knowledge exchange, collaborative discussions, and networking opportunities. By fostering a continuous dialogue between academia and industry, the program will seek to stay abreast of evolving industry needs and priorities. The insights gained from these interactions will enable the program to adapt its curriculum, research focus, and overall direction, ensuring alignment with the dynamic landscape of explosion protection engineering.

This conference initiative not only provides a mechanism for ongoing engagement but also serves as a means to showcase the program's achievements, research outcomes, and the expertise of its faculty and students. The visibility generated through such events can attract additional funding avenues, including sponsorships, grants, and partnerships. By actively involving stakeholders from both academia and industry, the program will be resilient to uncertainties in industry funding, fostering long-term success and relevance in the field of explosion safety.

Enrollment and Revenue Projections:
We project an initial enrollment of 10–15 XPE M.S. students / year. For AY 2025, using a tuition rate of $1,610 / credit-hour and 18 credit-hours / student that translates into over $200–300K in additional annual revenue.

As the program ramps up, research and teaching assistantships are generated, and industry responds, we project that enrollment could reach 20-30 XPE M.S. students / year. We plan to offer additional advanced engineering courses commensurate with increasing enrollment and expanding faculty interests. See Annex C for 5 year and 10 year plan that includes a cost expectation and revenue table.

Resources Needed:
The XPE M.S. program requires:

- 2 TA lines shared across three departments
- A faculty line in the future to teach a course in numerical explosion models

Implementation: The Explosion Protection Engineering M.S. program, including courses, will take effect for Academic Year 2024-2025.

Appendix: 5 year and 10 year plan

The ultimate goal is position **WPI as the global leader in Explosion Safety.** This will be achieved by focusing on three pillars:

- **Pioneering Excellence**
  - Strive to be the Global leader in Explosion Safety
- **Fundamentally Grounded**
  - Courses will focus on fundamentals
  - The focus will be on developing engineers who know what they are doing and know what to do when things change
- **Creating a Community**
  - The Center for Lifelong Professional and Personal Growth

The first two pillars of pioneering excellence and fundamentally grounded courses are evident from the world class faculty involved in the program and the program curriculum. The third pillar of "community creation" will be discussed further here.

Our 5 year goal is to secure a minimum of 10 students enrolled in an MS program within the first two years, with the vision of increasing this number to 20 for a sustainable program within 5 years. Students in FPE, Aero, Mechanical Engineering, and Chemical Engineering departments at WPI have expressed interest. Research focus will be geared towards several agencies. Attached is a research/funding/collaboration map for the program that we have developed.

Table C.1: Financial Projections for the Master of Explosion Protection Engineering (XPE) Program

Y	Enrollment	Tuition Revenue	Industry Investment	Total Revenue	TA Support Cost	Adjunct Teacher Cost	Faculty Line Cost	Total Cost	Net Difference
1	10	$242K	$25K	$267K	$50K	$15K	$0	$65K	$202K
2	15	$362K	$75K	$437K	$50K	$15K	$0	$65K	$372K
3	15	$362K	$100K	$462K	$50K	$15K	$0	$65K	$397K
4	20	$483K	$125K	$608K	$50K	$15K	$100	$165K	$443K
5	20	$483K	$150K	$633K	$50K	$15K	$100K	$165K	$468K

Tuition Revenue is calculated based on 15 credits per student per year at $1610 per credit hour

Total Revenue is the sum of Tuition Revenue and Industry Investment.

Total Cost is the combination of TA Support Cost, Adjunct Teacher Cost, and Faculty Line Cost.

Net Difference is the surplus of Total Revenue after all costs, reflecting the financial health of the program.

Since the program's success is linked to the close connection with a specialized industry the program organization will comprise of a **board of advisors** (academia, industry and government agencies) and a **steering committee (**funding partners only**)**. The goal is engage industry early on by defining targeted MS thesis projects. The goal is to secure funding for two MS thesis projects from industry sources to kick start the program and increase to five projects in five years. An initial commitment of $5000 per industry member for a placement in the steering committee is sort. We have an initial investment of $50,000 from the

industrial partners in the steering committee listed below. The goal is to increase the number to $100,000/year within 5 years and $200,000/year within 10 years. As, the quality of our education is seen by the industry, students graduate and an alumni base is developed, the set objectives should be easily achievable and even surpassed. The proposed model, will also allow the program to be adaptable to industry changes and emerging trends by incorporating mechanisms for regular curriculum review and updates.

Board of Advisors

1. Vyto Babrauskas (Fire Risk)
2. Tim Myers/Alfonso Ibarreta (Exponent)
3. Bawens (FM Global)
4. Trygve Skjold, Begen, Norway
5. Scott Rockwell
6. Faisal Khan (MKOPC)
7. Peter Sunderland (UMD)
8. Slava Akkerman (WVU)
9. Seongkyun Im

Steering Committee

1. Regis Bauwens (FM Global)
2. Tim Myers (Exponent)
3. Andreas Brandl (CTO, IEP)
4. Eric Maynard (Jenike and Johansson)
5. Tom Scherpa (Dupont)
6. Jeremy Lebowitz (Jensen Hughes)
7. Ashok Dastidar (Fauske)
8. Mark Boone (Dominion Energy)
9. Dan Madrzykowski (FSRI)
10. Marc T. Hodapp, PE | Fire & Risk Alliance, LLC

Appendix
Consent Agenda Motions

(see next page)

Date: May7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title of BME 3012

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title of BME 3012 Biomedical Sensors Laboratory be modifed to Biomedical Sensors Laboratory: Techniques, as described below.

Description of the Proposed Modification:

Current Course Title, Description, and Course Offering Schedule:

BME 3012 Biomedical Sensors Laboratory *(1/6 units; Cat. I)*
This laboratory-based course is designed to develop hands-on experimental skills relevant to the selection and application of various sensors used to acquire biomedical signals.
*Recommended Background:*BME 2210, ECE 2010, ECE 2019 or equivalent. Students who have previously taken BME 3011 may not receive credit for this course.

Proposed Course Title:

BME 3012 Biomedical Sensors Laboratory: Techniques

NOTE: This motion is to change only the course title, not the course description.

Rationale:
This course remains identical to BME3012 – Biomedical Sensors Lab but will have a new name so that to be consistent with the companion new course proposed, "BME 4012 – Biomedical Sensors and Instrumentation Laboratory: Applications". This will provide for clarity for our students in identifying the best BME labs to take for their experience level and interest areas.

Impacts on distribution requirements and students: None. This course can be taken to fulfill the existing BME 3000+ level lab requirements.

Resources Needed: No additional resource required.

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title of BME 3013

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title of BME 3013 Biomedical Instrumentation Laboratory be modified to Biomedical Instrumentation Laboratory: Techniques, as described below.

Description of the Proposed Modification:

Current Course Title, Description, and Course Offering Schedule:

BME 3013 Biomedical Instrumentation Laboratory *(1/6 units; Cat. I)*
This laboratory-based course is designed to develop hands-on experimental skills relevant to the design and application of analog instrumentation commonly used to acquire biomedical signals.
Recommended Background*:* BME 2210, ECE 2010, ECE 2019 or equivalent. Students who have previously taken BME 3011 may not receive credit for this course.

Proposed Course Title:

BME 3013. Biomedical Instrumentation Laboratory: Techniques

NOTE: This motion is to change only the course title, not the course description

Rationale:
This course remains identical to BME3013 – Biomedical Instrumentation Laboratory but will have a new name so as to be consistent with the companion new course proposed, "BME 4012 – Biomedical Sensors and Instrumentation Laboratory: Applications". This will provide for clarity for our students in identifying the best BME labs to take for their experience level and interest areas.

Impacts on distribution requirements and students: None. This course can be taken to fulfill the existing BME 3000+ level lab requirements.

Resources Needed: No additional resource required.

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title of BME 3014

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title of BME 3014 Physiological Signals Lab I: Applications" be modified to Physiological Signals Laboratory: Techniques, as described below.

Description of the Proposed Modification:

Current Course Title, Description, and Course Offering Schedule:

BME 3014 Physiological Signals Laboratory I: Techniques *(1/6 units; Cat. I)*
This course is an introduction to the computational methods used to extract and analyze the signals produced by biomedical phenomena. The goal of this course is to familiarize the student with implementing the most common algorithmic approaches for data analysis used in biomedical engineering. Coursework will cover programming for topics such as peak detection, spectral analysis and the fast Fourier transform FFT method, auto-regression analysis, polynomial trend removal, and signal filtering methods.
Recommended Background: A first course in MATLAB such as BME 2211, BME 1004 or equivalent.

Proposed Course Title:

BME 3014 Physiological Signals Laboratory: Techniques

NOTE: This motion is to change only the course title, not the course description

Rationale:
This petition requests a friendly amendment to remove "I" from the existing course title to align with the naming of all BME laboratory courses.

Impacts on distribution requirements and students: None. This course can be taken to fulfill the existing BME 3000+ level lab requirements.

Resource Needs: No additional resource required.

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title and number of BME 3503

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title and number of BME 3503 Skeletal Biomechanics Laboratory be modified to BME 3507 Skeletal Biomechanics Laboratory: Techniques, as described below.

Description of the Proposed Modification:

Current Course Title, Description, and Course Offering Schedule:

BME 3503: Skeletal Biomechanics Laboratory *(1/6 units; Cat. I)*
This laboratory course will help students increase their knowledge of the mechanics of the musculoskeletal system. Students will gain understanding of the course materials and technical skills through the combined hands-on application of state-of-the-art biomechanical testing equipment and computer simulation modules towards solving authentic problems involving balance, strength, and movement.
Recommended Background: Statics (ES 2501) and dynamics (ES 2503). Students who have previously taken BME3503 may not receive credit for this course.

Note: Students who previously took BME 3503 will not get credit for BME 3507

Proposed Course Title:

BME 3507 Skeletal Biomechanics Laboratory: Techniques

Note: Students who previously took BME 3503 will not get credit for BME 3507

NOTE: This motion is to change only the course title, not the course description

Rationale:
This course remains identical to BME3503: Skeletal Biomechanics Laboratory. This motion proposes to change the course number and the course title to align with the 3000 level and 4000 level lab course series. This is done for consistency across all companion lab courses in BME, for example BME 3507 and BME 4507. Since BME 4503 Computational Biomechanics course already exists, BME 3503 and BME 4503 sequence is not possible. Hence changing the course number from BME 3503 to BME 3507 is envisaged. A motion to add its companion course – BME 4507 is planned. Adding "Techniques" to the title aligns with the strategy of "Techniques" and Applications" labs for the 3000 and 4000 level labs respectively.

Impacts on distribution requirements and students: None. This course can be taken to fulfill the existing BME 3000+ level lab requirements.

Resources Needed: No additional resource required.

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title and number of BME 3506

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title and number of BME 3506 Solid Biomechanics Laboratory: Applications" be modified to BME 4505 Solid Biomechanics Laboratory: Applications, as described below.

Description of the Proposed Modifications:

Current Course Title and Number:

BME 3506 Solid Biomechanics Laboratory: Applications

Proposed Course Title and Number:

BME 4505 Solid Biomechanics Laboratory: Applications

Note: Students who previously took BME 3506 will not get credit for BME 4505

Rationale:
The course description for BME 4505 remains the same as for BME 3506 but will be taught at a higher level requiring more independent team-based research, thus is more appropriate at the 4000-level. This will provide clarity for our students in identifying BME lab for depth requirement.

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title and number of BME 3605

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title of BME 3605 Biotransport Laboratory II: Applications be modified to BME 4607 Biotransport Laboratory: Applications, as described below.

Description of the Proposed Modifications:

Current Course Title and Number:

BME 3605 Biotransport Laboratory II: Applications *(1/6 Units; Cat I)*
This application lab is a sequential extension of the corresponding techniques lab (BME 3607). This laboratory-driven transport course provides hands-on experience in measuring fluid flow, and mass transport in biologically relevant systems. Students gain an in-depth understanding of the course material from personal observations and measurements on model cardiovascular systems and connective tissues. Challenge-based laboratory projects will be assigned, requiring the students to determine and execute effective test methods at their own pace in a team setting and communicate their findings effectively. Systems modeled may include blood vessels, stenotic vessels, artificial heart valves and aneurysms. Connective tissues tested may include biomaterials, blood vessels and skin.
*Recommended Background:*Theory and laboratory techniques related to measurement of process variables such as pressure and flow rates, molecular diffusion apparatus and related equipment covered in BME 3607 Biotransport Laboratory: Techniques, Basic Chemistry (CH 1010, CH 1020), Basic Physics (PH 1010), and a knowledge of cell biology (BB 2550), and data analysis (BME 2210), or equivalent.

Proposed Course Title and Number:

BME 4607 Biotransport Laboratory: Applications

Note: Students who previously took BME 3605 will not get credit for BME 4607.

NOTE: This motion is to change only the course title, not the course description.

Rationale:
This course remains identical to BME 3605 Biotransport Laboratory II: Applications but will have a new name so as to be consistent with new 4000 level laboratory courses that the department is in the process of rolling out. The new title will be "BME 4607 – Biotransport Laboratory: Applications". In this motion, the course number is changed from a 3000- level to a 4000-level course. Additionally, the Roman numeral "II" from the original course title is removed to be consistent across all companion lab courses.

Impacts on distribution requirements and students: None. This course can be taken to fulfill the existing BME 3000+ level lab requirements.

Resources Needed: No additional resource required.

Implementation Date: AY2024-25

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title of BME 3811

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title of BME 3811 Biomaterials Lab be modified to Biomaterials Laboratory: Techniques, as described below.

Description of the Proposed Modification:

Current Course Title, Description, and Course Offering Schedule:

BME 3811: Biomaterials Lab *(1/6 Units; Cat I)*
This laboratory-driven course provides hands-on experience in the design, fabrication and characterization of biomaterials for medical applications. Students will use synthetic and natural polymer materials to fabricate a scaffold for applications such as tissue engineering, wound healing or controlled drug delivery. A challenge-based laboratory project will be assigned which will require the students to design a biomaterial scaffold that meets specific design criteria, and quantitatively assess the properties of this scaffold to evaluate how well the criteria were met. Design criteria may include mechanical strength, biocompatibility, porosity, degradation rate, or release kinetics. Students will complete the project at their own pace in a team setting and communicate their findings effectively.

Proposed Course Title:

BME 3811. Biomaterials Laboratory: Techniques *(1/6 Units; Cat I)*

NOTE: This motion is to change only the course title, not the course description

Rationale:
This course remains identical to BME3811 – Biomaterials Lab but will have a new name so as to be consistent with the companion new course proposed in a separate motion - "BME 4811 Biomaterials Laboratory: Applications". This will provide for clarity for our students in identifying the best BME labs to take for their experience level and interest areas.

Impacts on distribution requirements and students: None. This course can be taken to fulfill the existing BME 3000+ level lab requirements.

Resources Needed: No additional resource required.

Implementation Date: AY2024-25

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title of BME 3813

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title of BME 3813 Cellular Engineering: Techniques be modified to Cellular Engineering Laboratory: Techniques, as described below.

Description of the Proposed Modification:

Current Course Title, Description, and Course Offering Schedule:

BME 3813 Cellular Engineering: Techniques *(1/6 Units; Cat I)*
This laboratory-driven course provides hands-on experience in the application of bioengineering to control cellular processes. Students will be challenged to design an intervention to manipulate a specific cellular process (adhesion, proliferation, migration, differentiation) and use modern cellular and molecular biology tools to assess and refine their approach. Laboratory exercises will provide an overview of cell culture technique, microscopy and molecular probes, quantification of cell proliferation and migration, and assessment of cellular differentiation in the context of the assigned projects. Students will complete the project at their own pace in a team setting and communicate their findings effectively.
Recommended Background: Basic chemistry (CH 1010 and CH 1020) and a solid knowledge of cell biology (BB 2550) or equivalent.

Proposed Course Title:

BME 3813 Cellular Engineering Laboratory: Techniques

NOTE: This motion is to change only the course title, not the course description

Rationale:
In a previous motion, the course title was changed from BME 3813 Cellular Engineering Lab to BME 3813 Cellular Engineering: Techniques. In the process, the term "Lab" was inadvertently omitted from the title. This petition requests a friendly amendment to add "Laboratory" to the current title to read BME 3813 Cellular Engineering Laboratory: Techniques to match with all BME laboratory courses.

Impacts on distribution requirements and students: None. This course can be taken to fulfill the existing BME 3000+ level lab requirements.

Resources Needed: No additional resource required.

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course title and description of BME 4813

Motion: On behalf of the Department of Biomedical Engineering, the Committee on Academic Operation recommends, and I move that the course title and course description of BME 4813 Cellular Engineering: Applications be modified, as described below.

Description of the Proposed Modification:

Current Course Title, Description, and Course Offering Schedule:

BME 4813 Cellular Engineering: Applications *(1/6 Units; Cat I)*
This course provides experience in advanced cellular engineering techniques for students who are already proficient in basic mammalian cell culture methods. Students, in consultation with the course instructor, will formulate and conduct independent project(s) to answer specific questions/hypothesis from selected research topics. Students will develop their own experimental plans, taking into consideration the experimental set up, timelines, number of replicates, experimental controls, and strategies to test their hypothesis. Students must use proper statistical method(s) to test their hypothesis and present their findings.

Proposed course title, description, and course offering: (with added text highlighted in yellow)

BME 4813. Cellular Engineering Laboratory: Applications *(1/6 Units; Cat I)*
This application lab is a sequential extension of the corresponding techniques lab (BME 3813 Cellular Engineering: Techniques). This course provides experience in advanced cellular engineering techniques for students who are already proficient in basic mammalian cell culture methods. Students, in consultation with the course instructor, will formulate and conduct independent project(s) to answer specific questions/hypothesis from selected research topics. Students will develop their own experimental plans, considering the experimental set up, timelines, number of replicates, experimental controls, and strategies to test their hypothesis. Students must use proper statistical method(s) to test their hypothesis and present their findings.

Rationale:
The amendment in this motion intends to make two changes as follows:

a. Title change from BME 4813 Cellular Engineering: Applications to BME 4813 Cellular Engineering Laboratory: Applications
b. Add the statement "This application lab is a sequential extension of the corresponding techniques lab (BME 3813. Cellular Engineering: Techniques). Adding this language is meant to inform students that an understanding of the materials covered in BME3813. Cellular Engineering: Techniques is essential for success in BME4813.

Impacts on distribution requirements and students: No change from the original motion

Resources Needed: N/A

Implementation Date: Academic year 2024-25

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add BME 4012 Biomedical Sensors and Instrumentation Laboratory: Applications

Motion: On behalf of the Biomedical Engineering Department, the Committee on Academic Operations recommends, and I move that BME 4012 Biomedical Sensors and Instrumentation Laboratory: Applications, as described below, be added.

Proposed Course Description:

BME 4012 Biomedical Sensors and Instrumentation Laboratory: Applications *(1/6 units; Cat. I)*
This applications lab is a sequential extension of the corresponding techniques lab (BME 3012 and BME 3013). The lab course provides students with experience of utilizing biomedical sensors and instrumentation and their applications for biomedical engineering. The students will learn about the appropriate selection of sensors for clinically relevant problems. The students will work on design projects in teams to develop their instrumentation system that demonstrates proof-of-concept of a potentially useful biomedical instrument, analyzing and interpreting data and effective communication skills. The lab will build on the concepts in sensors and instrumentation introduced in BME 3012 Biomedical Sensors Laboratory: Techniques and BME 3013 Biomedical Instrumentation Laboratory: Techniques, and lower-level instrumentation and data analysis courses.

Recommended Background: Knowledge obtained in BME 3012, BME 3013 and ability to perform statistical analysis of the data.

Rationale:
The introductory "techniques" lab courses on biomedical sensors and biomedical instrumentation introduce students to the basics of sensors and instrumentation and their working principles. This "applications" course expands on the primary knowledge and provides students with experience in selecting and designing appropriate sensor and instrumentation systems. The students will develop a prototype sensor and/or instrumentation system that demonstrates proof-of-concept of a biomedical instrument fulfilling some clinical need. This will help students to develop the necessary skills required to design and implementation of sensor and/or instrumentation system for a given clinical need.

Impacts on students: The new course will impact current and future students by helping them develop expertise in utilizing electronic sensors and instrumentation in the context of biomedical engineering. By the end of the course the student should be able to:

- Gain experience with appropriate sensor selection for a given research problem/user need.
- Understand the clinical and research aspects of biomedical sensors and instrumentation.
- Design a sensor and instrumentation system to demonstrate a proof-of-concept to address a clinical need.
- Ability to develop and conduct appropriate experimentation, analyze and interpret data from sensors, and use engineering judgment to draw conclusions

Resources Needed:

- Instructor: Part of the regular teaching load for Prof. Taimoor Afzal
- Classroom: Standard classroom with whiteboard or chalkboard and computer/video projection equipment to accommodate up to 20 students
- Laboratory: Biomedical Instrumentation and design lab (AK-014)
- Library resources: no staff required.
- Information Technology: no special support needed.

- Other: TA and PLA support for grading and student consultation

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add BME4507 Skeletal Biomechanics Laboratory: Applications

Motion: On behalf of the Biomedical Engineering Department, the Committee on Academic Operation recommends, and I move that BME 4507 Skeletal Biomechanics Laboratory: Applications, as described below, be added.

Proposed Course Description:

BME 4507. Skeletal Biomechanics Laboratory: Applications *(1/6 units; Cat. I)*
This application lab is a sequential extension of the corresponding techniques lab (BME 3507). This course provides hands-on experience with applying/utilizing state-of-the-art mechanical testing equipment and software to characterize whole-body biomechanics, including balance, strength, and movement, in the context of an authentic real-world challenge. Students will work in teams to design and execute experiments, utilize appropriate testing equipment, analyze, and interpret data, and effectively communicate results.

Recommended Background: A demonstrated ability to independently use skeletal biomechanics equipment to measure balance, kinetics, and kinematics is essential (BME 3507) and the ability to perform statistical analysis of test data.

Rationale:
The purpose of this course is to provide Biomedical Engineering students with hands-on experience utilizing biomechanical equipment to analyze the musculoskeletal system relevant to human health.

Impacts on students: This course will help students develop an in-depth knowledge of whole-body biomechanics. This is accomplished by students acquiring, analyzing and interpreting data related to kinematics and kinetics during human movement. Students will demonstrate knowledge of mechanical concepts of internal and external forces occurring within the human musculoskeletal system by applying concepts to a real-world challenge.

By the end of the course the student will be able to:
- Design and conduct experiments using skeletal biomechanics equipment, analyze and interpret data from living systems, and use engineering judgement to draw conclusions
- Communicate effectively with a range of audiences
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

This course is a higher-level skeletal biomechanics course that will impart "depth" for students pursuing the biomechanics track in BME.

Resources Needed:
- Instructor: Part of the regular teaching load for Prof. Karen Troy
- Classroom: none
- Laboratory: Biomechanics lab with whiteboard or chalkboard, computer/video projection equipment, and biomechanics equipment to accommodate up to 10 students
- Library resources: no staff required
- Information Technology: no special support needed
- Other: TA and PLA support for grading and student consultation

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add BME 4811 Biomaterials Laboratory: Applications

Motion: On behalf of the Biomedical Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that BME4811 Biomaterials Laboratory: Applications, as described below, be added.

Proposed Course Description:

BME 4811 Biomaterials Laboratory: Applications *(1/6 units; Cat. I)*
This application lab is a sequential extension of the corresponding techniques lab (BME 3811). This applications-based, laboratory-driven course provides hands-on experience in the design, fabrication, and characterization of biomaterials for medical applications. Students will use synthetic and natural polymer materials to fabricate a scaffold for applications such as tissue engineering, wound healing, or controlled drug delivery. A challenge-based laboratory project will be assigned which will require the students to design a biomaterial scaffold that meets specific design criteria, and quantitatively assess the properties of this scaffold to evaluate how well the criteria were met. Design criteria may include mechanical strength, biocompatibility, porosity, degradation rate, or release kinetics. Students will complete the project in a team setting and communicate their findings effectively.

Recommended Background: Basic materials science as in ES 2001 or BME 2001, Biomaterials laboratory techniques BME 3811 and data analysis BME 2210.

Expected yearly enrollment: 40 (20 students per offering)

Rationale:
The purpose of this course is to provide Biomedical Engineering students with hands-on project-based experience in applying techniques in fabrication and analysis of biomaterials to a project in a team setting to establish and achieve goals related to the design and analysis of biomaterials to achieve a given function related to human health. This course is part of a two-course series, one at the 3000 level "Techniques" course for breadth and one at the 4000-level "Applications" course for depth. This aligns with the rest of the lab course series proposed by BME department.

Impacts on students: This course will help students develop an understanding of biomaterial applications and data analysis relevant for biomedical engineers. By the end of the course the student should have:

- Increased skills for selecting and applying appropriate biomaterials to achieve specific project goals.
- Increased experience with team-based project work, writing laboratory reports and giving oral presentations.
- Ability to develop and design and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions.

Resources Needed:

- Instructor: Part of the regular teaching load for Prof. Ray Page
- Classroom: None
- Laboratory: SL 219, the current biomaterials lab
- Library resources: no staff required
- Information Technology: no special support needed
- Other: TA and PLA support for grading and student consultation

Preferred term(s): B and D

Implementation Date: 2024-25 academic year

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the lab course requirements for the B.S. degree in Biomedical Engineering

Motion: On behalf of the Biomedical Engineering Department, the Committee on Academic Operations recommends, and I move that the lab course requirements for the B.S. degree in Biomedical Engineering be modified, as described below.

Description of the Proposed Modification:

CURRENT LAB COURSE REQUIREMENTS:
(as they appear on page 504 of the 2023-24 undergraduate catalog)

C. 9/3 units in Biomedical Engineering which must include the following:

……

ii. 2/3 units of BME laboratories at the 3000+ level (four 1/6 units labs)

…….

CURENT BIOMEDICAL ENGINEERIN PROGRAM CHART:
(as it appears on page 510 of the 2023-24 undergraduate catalog)

9/3 UNITS

BIOMEDICAL ENGINEERING*,a
4/3 units BME at ≥ 2000-level
2/3 units BME laboratories at ≥ 3000-level (four 1/6-unit labs)
1/3 unit Design
1/3 unit at 4000-level
1/3 unit at ≥ 4000-level
At least 1/6 unit must fulfill the living systems laboratory requirement†

* 1000-level courses do not satisfy requirements
† BME 3111, BME 3012, BME 3503, or BME 3813
BME3111 can count towards 4/3 units BME at ≥ 2000-level or the physiology requirement above, but cannot double-count towards both

PROPOSED LAB COURSE REQUIREMENTS
(with deletions shown with ~~strikethrough~~ and additions shown in red):

C. 9/3 units in Biomedical Engineering which must include the following:

……

ii. 2/3 units of BME laboratories at the 3000+ level (four 1/6 units labs)- three labs at the 3000 level and one lab at the 4000 level. One 3000 and one 4000-level lab should match one "focus pair" in sequence from the list below. Note: 4000-level labs cannot be used to count for the 4000-level BME course requirement or 4000+ level BME course requirement

BME Lab Focus Pairs
Choose 2 labs from the following BME Focus Pairs:

- Bioinstrumentation Laboratory: Techniques & Applications (BME3012 or BME3013 + BME4012)
- Solid biomechanics Laboratory: Techniques & Applications (BME3505 + BME4505)
- Musculoskeletal biomechanics Laboratory: Techniques & Applications BME3507 and BME4507
- Biotransport Laboratory: Techniques & Applications (BME3607 + BME4607)
- Biomaterial Laboratory: Techniques & Applications (BME3811 + BME4811)
- Cell engineering Laboratory: Techniques & Applications (BME3813 + BME4813)

PROPODSED BIOMEDICAL ENGINEERIN PROGRAM CHART:
PROPOSED CHANGES: Added note below the table highlighted in yellow)

9/3 UNITS

BIOMEDICAL ENGINEERING*,a
4/3 units BME at ≥2000-level
2/3 units BME laboratories at ≥ 3000-level (four 1/6-unit labs)**
1/3 unit Design
1/3 unit at 4000-level
1/3 unit at ≥ 4000-level
At least 1/6 unit must fulfill the living systems laboratory requirement†

* 1000-level courses do not satisfy requirements

† BME 3111, BME 3012, BME 3503, or BME 3813

** 4000 level labs cannot be used to count for the 4000-level BME requirement or 4000+ level BME course requirement

BME3111 can count towards 4/3 units BME at ≥ 2000-level or the physiology requirement above, but cannot double count towards both

Rationale:
The BME department currently requires that students take four 3000 level 1/6-unit labs as part of their BME course distribution requirement for hands-on experience. To provide breadth and depth in the laboratory courses, the department proposes to modify the lab requirements to reduce the number of 3000-level BME

labs to three for “breadth” and add one 4000-level BME lab for “depth” in a two-lab sequence. The “focus pair” method from IMGD is adopted to clarify the specific sequences of the labs. Associated motions have been submitted to make the lab course numbers and titles consistent and clear for the sequences, e.g., 3503 changed to 3507 for 3507+4507 sequence, and “Techniques” added for all 3000-level labs and “Applications” added for all 4000-level labs.

The experience gained in a lab course is vastly different from the experience gained in a 4000-level lecture-based course, thus the BME faculty determined that 4000-level lab courses should not be allowed to meet that requirement.

Resources Needed: There are no new resources needed to implement these revisions. This change does not alter the 4-lab requirement. Associated motions have been submitted which elevate the level of multiple 3000-level “applications” labs to 4000-level for clarity that the “applications” labs are the second in the sequence and are at greater depth than the 3000-level labs.

Impacts: Current BME majors will be allowed to follow the new degree requirements. There is no change in the number of lab courses required with this change.

Implementation Date: Implementation date for this action is the 2024-2025 Academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add AR 1400: Digital Photography

Motion: On behalf of the Humanities and Arts Department, the Committee on Academic Operations recommends, and I move that the AR 1400: Digital Photography, as described below, be added.

Proposed Course Description:

AR 1400 Digital Photography *(1/3 units; Cat. II)*
This course teaches students the use of DSLR cameras to capture high quality images. Students will learn to produce images with correct exposure by using camera controls such as f/stops, shutter speeds, film speeds. The application of principles and elements of design in photography will be explored, and students will learn to create effective compositions by the use of depth of field, action motion, shadows and light, and camera angles. Projects may include still life, portraits, architectural and landscape, product and industrial photography as well as postproduction techniques.

Recommended Background: None

Anticipated Instructor: Roshanak Bigonah

Rationale:
With the availability of high-resolution cameras on mobile phones, photography has become a daily routine in our contemporary lives. Even though the average number of pictures taken per day by most people has significantly increased, knowledge of photography as an art has not kept pace with this increasing interest.

The objective of this course is to introduce students to digital photography as visual art. The students will be taught materials to enable them to understand effective visual communication and factors that affect this communication. They will learn to use of cameras and editing software available to apply lighting, depth of field, contrasts, and camera angle in shaping this communication.

Many art courses such as Graphic Design, Digital Imaging and Computer Arts, and 3D Environmental Modeling require students to work with original images. This course in Digital Photography enables these students to produce images as sources for other art work. The camera skills and compositional principles learned in this course also provide the foundation for courses such as Video Production and Documentary Short Video Production or any other video production related project.

This course will be valuable to many students in a broad range of applications. One specific application will be teaching photography to the students who take pictures to include in their IQP and MQP reports. For our students who complete their MQPs and IQPs abroad through Global Project Program, this course will be of great value. The students will learn how to take pictures that capture their experience in other cultures.

Impacts on students: Student learning outcomes - After completing this course, students will
- Understand the function of the major controls on your camera.
- Understand the relationship between lighting effects and proper exposure.
- Understand compositional concepts in photography.
  to become familiar with historical and contemporary photography.
    - Learn how to edit and manipulate images using Adobe Photoshop.

Projected Enrollment: 25 students/year. The intended audience: All students seeking to complete their Humanities & Arts requirement with depth in Art

Implementation Date: Implementation date for this action is the 2024-2025 Academic year.

Resources Needed:

Instructor: This course will be taught by Prof. Roshanak Bigonah as part of her regular teaching load.

Classroom: The class will be taught in the IMGD computer lab (FL222) or SL123, which already contain all of the required computers and software: Photoshop

Equipment: Students taking this course are expected to have their own entry-level DSLR with a kit lens and a tripod. However, for students for whom the cost of acquiring this equipment represents an obstacle to participation, ATC has a limited number of these items (currently 8) available for students to check out at no cost. If this experimental course shows that more equipment is needed, the department will work with ATC to supplement the collection for future offerings of this course.

Library: No additional library resources will be required.

Appendix: Summary of Experimental Offering of the Course:

The course was offered as an experimental course (AR140x) in D term 2023 (and will be offered for a 2nd time in D 2024). Student feedback from the first offering (23 students) was generally positive, with a few suggestions for reorganizing the presentation of course material that have been incorporated into the plans for the second iteration. From the instructor's standpoint, the course was quite successful for a first offering. Students assimilated the course materials effectively, as demonstrated by student projects that met or exceeded expectations.

Course evaluations: (11 respondents)

1. "My overall rating of the quality of this course is" 0 1 2 6 7 (4.3)
2. "My overall rating of the instructor's teaching is" 0 0 4 3 9 (4.4)
7. "The amount I learned from the course was" 0 2 3 8 3 (3.8)
19. "On average, what were the total hours spent in each 7-day week OUTSIDE of formally scheduled class time in work related to this course (including studying, reading, writing, homework, rehearsal, etc)?" 0 hr/wk **0**, 1-5 hr/wk **9**, 6-10 hr/wk **1**, 11-15 hr/wk **1**, 16-20 hr/wk **0**, 21 hr/wk or more **0**.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to renumber 25 Music (MU) courses

Motion: On behalf of the Humanities and Arts Department, the Committee on Academic Operations recommends, and I move that 25 Music courses be renumbered, as described below.

Description of the Proposed Modifications:

Current and proposed course numbers:

Current Course Numbers and Names	Proposed Numbers
MU 2501: Conducting	2451*
MU 2631: Glee Club	2401*
MU 2632: Alden Voices	2402*
MU 2633: Brass Ensemble	2431*
MU 2636: Concert Band	2430*
MU 2637: Orchestra	2420*
MU 2638: Chamber Choir	2403*
MU 2639: String Quartet	2421*
MU 2640: African Drumming Ensemble	2413*
MU 2641: Percussion Ensemble	2440*
MU 2642: Jazz Combo	2410*
MU 2643: Jazz Ensemble	2411*
MU 2644: Stage Band	2412*
MU 2719: Jazz History	2010
MU 2722: History of American Popular Music	2020
MU 2723: Music Composition	2100
MU 2801: Making Music with Machines	2301
MU 3001: World Music	3230
MU 3510: Music in Time of Conflict	3201
MU 3614: Topics in Midi	3301
MU 3615: Topics in Digital Sound	3302
MU 3616: Topics in Interactive Programming	3303
MU 3620: Electronic Music Composition	3300
MU 3730: Jazz Theory	3110
MU 4621: Independent Instruction (Lessons) in Music	2450

* denotes Performance course

Proposed modifications to course descriptions:
For each of the non-performance courses (new course numbers other than those that start with 24xx), the following sentence will be added to the course description:

> "Students that have earned credit for MU [old number] cannot receive credit for MU [new number]."

Resulting Course Numbering and Thematic Groupings:

2024-2025		
1000	Music and Its Makers	History
2001	History of Western Art Music Before 1750	
2002	History of Western Art Music After 1750	
2010	Jazz History	
2020	History of American Popular Music	
1100	Foundations of Music Theory and Aural Skills	Theory and Composition
2100	Music Composition	
2101	Arranging and Orchestration	
3110	Jazz Theory	
2201	Sounds of Social Justice	Music and Culture
3201	Music in Time of Conflict	
3202	Music, Gender, and Power	
3210	Topics in African American Music	
3230	World Music	
2300	Foundations of Music Technology	Music Technology
2301	Making Music with Machines	
3300	Electronic Music Composition	
3301	Topics in MIDI	
3302	Topics in Digital Sound	
3303	Topics in Interactive Programming	

(Table continued on next page)

2401	Glee Club	Performance
2402	Alden Voices	
2403	Chamber Choir	
2410	Jazz Combo	
2411	Jazz Ensemble	
2412	Stage Band	
2413	African Drumming Ensemble	
2420	Orchestra	
2421	String Quartet	
2430	Concert Band	
2431	Brass Ensemble	
2440	Percussion Ensemble	
2450	Independent Instruction in Music	
2451	Conducting	

2501	Music and Mind	Psychology

Rationale:
The current numbering of music courses does not express an organizational logic. The proposed numbers will make thematic groupings clear:

Organizational conventions exist within and across thematic categories. For example, xx00 indicates a foundational course, while xx1x groups courses together that focus on music of the African diaspora. This structure reveals balance within our curriculum and provides space and inspiration for curricular additions in the future.

Impacts on students: These modifications will make it easier for students to navigate the curriculum to identify coherent paths of study.

Resource Needs: This change does not require any new resources.

Implementation Date: The proposed changes are expected to be implemented starting from the 2024-2025 academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add GOV 2100 Engineering and Public Policy

Motion: On behalf of the Social Science and Policy Studies Department, the Committee on Academic Operation recommends, and I move, that GOV 2100: Engineering and Public Policy, as described below, be added.

Proposed Course Description:

GOV 2100: Engineering and Public Policy *(1/3 Units; Cat. II)*
Twenty-first century engineers tackle complex problems influenced by not only technology but also social systems. In order to develop sustainable solutions, there is a need to understand the interface between engineering and societal processes such as public policy. This course examines the interactions between engineering and public policy, and introduces students to the concepts, tools and methods involved in public policy making and policy analysis to understand policy impact on engineering domains. This course is a bridge between engineering and public policy.

Recommended background: None

Note: Students who have previously taken GOV210X may not receive credit for this course.

Intended audience: The course is open to all students.

Instructor: Prof. Shamsnaz Bhada

Expected enrollment: 50

Rationale:
This course has several purposes. First, it addresses the lack of introductory policy analysis courses for engineers at WPI. Second, it directly engages engineers by using engineering case studies. Finally, it broadens student's understanding of the interface between engineering and public policy.
This course was taught in D-Term 2022 and 2024 with 33 and 44 enrollments and good student evaluation.

Resources Needed:
- Professor Shamsnaz Bhada
- Classroom Room for 50 students
- Laboratory N/A
- Library resources N/A
- Information Technology: SSPS

Preferred term: D

Implementation date: Academic year 2024-2025

Contact: Prof. Robert Krueger

Appendix: Summary of 2023 and 2022 Experimental Offerings of the Course:
Assessment: The course was assessed through WPI student feedback forms and informal mid-term evaluations**.** Here are some quotes from the student evaluations:

2023 students
"I liked how we applied what we learn to real world applications. It was a really good course to get perspective on how engineering projects and design process can impact society. It gave me a new insight to how I can make more conscientious decisions when problem solving."

"*I particularly liked learning about concrete ways that public policy helps and is informed by engineering. I also liked learning about the engineering design process and the public policy process and how they relate and interact with each other. Finally, I liked the in-class activities and discussions."*

2022 Students

"Good course. I enjoyed the subject matter, and it was helpful in understanding engineering by means of a different scope, one that is often not looked through by us students. Professor Bhada is a very good teacher and very helpful when dealing with problems such as makeup work and quizzes. I joined the class late and was able to catch up right away thanks to her quick correspondence and helpfulness in communicating course objectives"

"The material was interesting, and it bridges a gap that needs to be filled regarding policy and technology."

Course Evaluations

Course Number	**Title**	**Enrollment**	**Term/Semester**	**Ratings**	
				Overall	**Instructor**
GOV 210X	Engineering and Public Policy -1	33	D-Term 2022	4.2	4.1
GOV 210X	Engineering and Public Policy	44	D-Term 2023	3.6	3.7

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add MA 4644 Introduction to Time Series Analysis

Motion: On behalf of the Department of Mathematical Sciences, the Committee on Academic Operations, and I move that MA 4644 Introduction to Time Series Analysis, as described below, be added.

Proposed Course Description:

MA 4644 Introduction to Time Series Analysis *(1/3 Units; Cat. II)*
This course introduces basic concepts and methods for time series analysis and forecasting, as well as related statistical software and real-world data applications. Topics include autocorrelation function, partial autocorrelation function, extended autocorrelation function, autoregressive-moving-average models, models for seasonal time series, unit-root test, integrated processes, distributed lag models, and transfer function models. Optional topics may include conditional heteroscedastic models and the Kalman filter. This course will be offered in 2025-2026 and alternating years thereafter.

Recommended Background: This course assumes knowledge of basic probability theory and statistical inference (MA2612, MA 2621, MA 2631, or MA 3631, or equivalent). Some programming experience is also recommended.

Intended audience: This course is designed for undergraduate students who are interested in time series analysis, such as juniors or seniors studying Actuarial Mathematics, Business, Mathematical Sciences, Statistics, and Data Science.

Expected enrollment: 10-20 students

Rationale:
Time series, a series of observations collected sequentially over time, is one of the most common data types encountered in daily life. Time series analysis has become increasingly important in many fields of research and application (e.g., biology, business, data sciences, economics, engineering, environmental sciences, finance, medicine, physics, statistics, and social sciences). This course is designed to help students develop analytical skills, quantitative skills, and computational skills that are essential in time series modelling and forecasting. Through this course, students will learn techniques for (1) analyzing temporally referenced data that exhibit seasonal variation, a deterministic trend, or a stochastic trend; and for (2) predicting one time series from another time series by exploring their cross-dependence structure. Students will also learn how to apply these techniques to real-world data via hands-on projects.

An experimental version of this course, MA 464X, has been offered in C 2023 (6 students) and C 2024 (7 students), with students from Computer Science, Data Science, Electrical and Computer Engineering, Mass Academy, Mathematical Sciences, Mechanical Engineering, and Physics. The C 2023 course evaluation was 4.4 based on 5 responses. With a permanent course number and the positive feedback, we project that the course will attract more students and the enrollment will increase to the range of 10-20 students.

Anticipated/interested Instructor(s): Professors Buddika Peiris, Fangfang Wang, and Jian Zou.

Resources Required:
- Classroom: Standard classroom with the capacity to hold 20 students
- Library resources: No additional needs for library resources.
- Information Technology: No special support or equipment is needed from the ATC

Preferred term: A or C

Implementation Date: AY2024-2025

Date: May 7, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Committee on Academic Policy (Prof. Calli, Chair)
Re: Motion to change the degree title and distribution requirements for the Management Information Systems major

Motion: On behalf of the Business Scool, the Committee on Academic Operations and the Committee on Academic Policy recommend, and we move that the degree title and distribution requirements for the Management Information Systems (MIS) major be modified as described below.

Description of the Proposed Modifications:

Current Degree Title and Distribution Requirements:

***Current Degree Title*:** Management Information Systems

Current Distribution Requirements:

Mathematics	4/3 units
Basic Science	2/3 units
Computer Science	1/3 units
Business Foundation	11/3 units (2/3 units also fulfill the WPI social science requirement)
MIS Major	6/3 units
Breadth Electives	3/3 units
MQP	3/3 units
Total	***30/3 = 10 units***

Proposed Degree Title and Distribution Requirements:

Proposed Degree Title: Information Systems and Technologies (ISTech)

Proposed Distribution Requirements:

Mathematics	4/3 units (unchanged)
Basic Science	2/3 units (unchanged)
Computer Science	1/3 units (unchanged)
Core Management Curriculum	7/3 units (see detail below)
ISTech Core and Technical, Analytics and AI Curriculum	7/3 units (see detail below)
ISTech Elective Options	6/3 units (see detail below)
MQP	3/3 units (unchanged)
Total	***30/3 = 10 units***

Core Management Curriculum (7/3 Units)

Financial Courses (4/3 units)

1. ACC 2060 Financial Statements for Decision Making
2. FIN 2070 Fundamentals of Finance or
   FIN 1250 Personal Finance or
   OIE 2850 Engineering Economics
3. MIS 3010 Creating Value through Innovation

4. ECON 1110 Introductory Microeconomics or
   ECON 1120 Introductory Macroeconomics or
   ECON 2910 Economics and Entrepreneurship

Managerial Courses (3/3 units)
1. Any OBC (OBC 1010 Leadership Practice recommended)
2. Any MKT (MKT 4030 Achieving Strategic Effectiveness recommended)
3. Any BUS, ETR, MKT, or OBC
   (BUS 1020 Global Environment or BUS 2020 Legal Environment recommended)

ISTech Core and Technical, Analytics and AI Curriculum (7/3 Units)

ISTech Core (Required) Courses (3/3 units)
1. MIS 3720 Business Data Management
2. MIS 4084 Business Intelligence or MIS 4741 User Experience and Design
3. MIS 4720 Systems Analysis and Design (take prior to MQP)

Technical, Analytics, and AI Courses (4/3 units)
1. CS 2119 (to follow CS 1004) or
   CS 2102/2103 (to follow CS 1101/1102)
2. BUS 2080 Data Analysis for Decision Making or OIE 2081 Intro. to Prescriptive Analytics
3. OIE 3020 Achieving Effective Operations
4. MIS 3787 Business Applications of Machine Learning or MIS 3730 Artificial Intelligence with Business Application

ISTech Elective Options (6/3 Units)

Select 6 courses from at least two of the groups below*:
- Analytics and AI electives: MIS 3787, MIS 3730, MIS 4084, OIE 2081, OIE 3460, OIE 3510, OIE 4430
- FinTech electives: MIS 2300, FIN 3300, FIN 3310, FIN 3330
- User Experience electives: MIS 4741, MKT 3650, CS 3041
- Technical electives: Any courses with prefix CS (except CS 3043), DS, or MA

*No course can count twice in the curriculum; for example, the courses selected as part of the 4/3 Technical, Analytics, and AI courses cannot also meet the MIS electives requirements.

The proposed changes to the WPI Undergraduate Catalog are describedin the Appendix to this motion.

Rationale:

The degree title and change to distribution requirements support STEM certification of the program, contributing to the technology-focused mission of the WPI Business School. The change to the distribution requirements also adopts the structure of recent changes to the MGE degree (implemented in 2022/23), which groups foundational course into financial and managerial areas and core courses into information systems and analytics areas. Courses have also been updated to reflect current industry requirements for information systems professionals.

The proposed CIP code that matches the revised program is Code 11.0103 Information Technology, defined as a program that focuses on the design of technological information systems, including computing systems, as solutions to business and research data and communications support needs. Includes instruction in the principles of computer hardware and software components, algorithms, databases, telecommunications, user tactics, application testing, and human interface design. This CIP code is STEM certified.

The CIP code's focus on developing solutions for business needs and designing computing systems aligns perfectly with our program's objectives. Our curriculum covers the broad range of topics in the CIP description, while emphasizing algorithms to a lesser extent and providing minimal detail on computer hardware and telecommunications. Previously, our program included dedicated courses on hardware and telecommunications. As industry demands evolved, we have adapted our program to meet current expectations. Specifically, companies no longer prioritize extensive knowledge in hardware and telecommunications from our students. Instead, we have introduced more contemporary subjects such as analytics, machine learning, and AI to ensure our graduates are equipped with the skills most relevant to today's technology landscape.

Implementation Date: Implementation date for this action is the 2024-25 academic year.

Proposed Catalog Changes: See following pages. Additions are highlighted in yellow; deletions are crossed out.

Appendix: Proposed Changes to the WPI Undergraduate Catalog

(with text to be added highlighted in yellow and text to be deleted struckthrough)

Information Systems and Technologies ~~Management Information Systems~~ Major

Degree Type

Bachelor of Science

Educational Objectives

The objectives of the Information Systems and Technologies ~~Management Information Systems~~ major are:

- To prepare students for positions involving the design and deployment of business applications using a wide variety of advanced information technologies, especially in high technology business, consulting, and service firms, in either start-up or established environments, and to prepare students for rapid advancement to project management ~~and other management positions~~ roles and accelerated paths to leadership positions.

- To provide the knowledge and skills consistent with the professionally accepted IS curriculum guidelines. Specifically, this includes providing knowledge and skills related to:
  - business application development tools;
  - database, web-based, ~~and~~ machine learning and artificial intelligence applications;
  - integrating IT into existing organizations through managing and leading systems analysis and design projects;
  - communicating effectively via written and oral presentations.

- To develop student abilities necessary for continued career growth including:
  - the ability to integrate theory and practice and to apply knowledge of information technology issues with the foundations of management;
  - the ability to integrate technology and change into existing organizations;
  - the ability to think critically and analytically, to define and solve business problems, work in teams, and think globally; and
  - the ability to learn new skills in response to changing professional requirements.

Program Distribution Requirements for the Information Systems and Technologies ~~Management Information Systems~~ Major

Mathematics and Science

Mathematics (4/3 units)

Mathematics must include 2/3 units of calculus and 2/3 units of statistics.

Item #	Title	Units
MA 1021	Calculus I	1/3
MA 1022	Calculus II	1/3
MA 2611	Applied Statistics I	1/3
MA 2612	Applied Statistics II	1/3

Computer Science (1/3 unit)

A minimum of 1/3 unit of Computer Science focused on programming.
CS 1004, CS 1101, or CS 1102 is recommended. (CS 2022 and CS 3043 are not accepted.)

Item #	Title	Units
CS 1004	Introduction to Programming for Non-Majors	1/3
CS 1101	Introduction to Program Design	1/3
CS 1102	Accelerated Introduction to Program Design	1/3

Basic Science (2/3 unit)

Biology, Chemistry, Geology, Physics

~~Business Core Curriculum~~

~~Business Foundation (11/3 units)~~

~~Item #~~	~~Title~~	~~Units~~
	~~ECON 1110 or ECON 1120 or ECON 2910/ETR 2910~~	~~1/3~~
	~~ID 2050 or one from DEV, ECON, ENV, GOV, PSY, SD, SOC, SS, STS~~	~~1/3~~
~~OBC 1010~~	~~Leadership Practice~~	~~1/3~~
~~BUS 1020~~	~~Global Environment of Business Decisions~~	~~1/3~~
~~BUS 2020~~	~~The Legal Environment of Business Decisions~~	~~1/3~~
~~ACC 2060~~	~~Financial Statements for Decision Making~~	~~1/3~~
~~BUS 2080~~	~~Data Analysis for Decision Making~~	~~1/3~~
~~FIN 2070~~	~~Risk Analysis for Decision Making~~	~~1/3~~
~~MIS 3010~~	~~Creating Value Through Innovation~~	~~1/3~~
~~MKT 4030~~	~~Achieving Strategic Effectiveness~~	~~1/3~~
~~OIE 3020~~	~~Achieving Effective Operations~~	~~1/3~~

~~ECON 1110 or ECON 1120 or ECON/ETR 2910 and ID 2050 or one from DEV, ECON, ENV, GOV, PSY, SD, SOC, SS,~~

~~STS fulfill the WPI Social Science requirement.~~

~~Management Information Systems (6/3 unit)~~

~~Complete the following four: (CS 2119 or CS 2102 or CS 2103), MIS 3720, MIS 3787, MS 4720~~

~~Item #~~	~~Title~~	~~Units~~
	~~CS 2119 or CS 2102 or CS 2103~~	
~~MIS 3720~~	~~Business Data Management~~	~~1/3~~
~~MIS 3787~~	~~Business Applications of Machine Learning~~	~~1/3~~
~~MIS 4720~~	~~Systems Analysis and Design~~	~~1/3~~

~~Select two courses from: (CS 2102 or CS 2103), (CS 2301 or CS 2303) CS 3041, DS 1010, MIS 4084, MIS 4741~~

~~Item #~~	~~Title~~	~~Units~~
~~MIS 4084~~	~~Business Intelligence~~	~~1/3~~
~~MIS 4741~~	~~User Experience and Design~~	~~1/3~~
	~~CS 2102 or CS 2103~~	
	~~CS 2301 or CS 2303~~	~~1/3~~
~~CS 3041~~	~~Human Computer Interaction~~	~~1/3~~
~~DS 1010~~	~~Data Science I: Introduction to Data Science~~	~~1/3~~

~~Breadth Electives (3/3 unit)~~

~~Breadth Electives must include at least 1/3 unit from among the 3000- and 4000-level courses in the Business department. The remaining 2/3 units specified in the requirement may be satisfied with courses from Mathematics, Basic Science, Computer Science, Data Science, Social Science (except ID/SS 2050), or courses with any of the following prefixes: ACC, BUS, ETR, FIN, MIS, MKT, OBC, or OIE.~~

Core Management Curriculum (7/3 Units)

Financial Courses (4/3 units)

1. ACC 2060 Financial Statements for Decision Making
2. FIN 2070 Fundamentals of Finance or
   FIN 1250 Personal Finance or
   OIE 2850 Engineering Economics
3. MIS 3010 Creating Value through Innovation
4. ECON 1110 Introductory Microeconomics or
   ECON 1120 Introductory Macroeconomics or
   ECON 2910 Economics and Entrepreneurship

Managerial Courses (3/3 units)

1. Any OBC (OBC 1010 Leadership Practice recommended)
2. Any MKT (MKT 4030 Achieving Strategic Effectiveness recommended)
3. Any BUS, ETR, MKT, or OBC
   (BUS 1020 Global Environment or BUS 2020 Legal Environment recommended)

ISTech Core and Technical, Analytics and AI Curriculum (7/3 Units)

ISTech Core (Required) Courses (3/3 units)

1. MIS 3720 Business Data Management
2. MIS 4084 Business Intelligence or MIS 4741 User Experience and Design
3. MIS 4720 Systems Analysis and Design
   (take prior to MQP)

Technical, Analytics, and AI Courses (4/3 units)

1. CS 2119 (to follow CS 1004) or
   CS 2102/2103 (to follow CS 1101/1102)
2. BUS 2080 Data Analysis for Decision Making or OIE 2081 Intro. to Prescriptive Analytics
3. OIE 3020 Achieving Effective Operations
4. MIS 3787 Business Applications of Machine Learning or MIS 3730 Artificial Intelligence with Business Application

ISTech Elective Options (6/3 Units)

Select 6 courses from at least two of the groups below*:

- Analytics and AI electives: MIS 3787, MIS 3730, OIE 2081, OIE 3460, OIE 3510, OIE 4430
- FinTech electives: MIS 2300, FIN 3300, FIN 3310, FIN 3330
- User Experience electives: MIS 4741, MKT 3650, CS 3041
- Technical electives: Any courses with prefix CS (except CS 3043), DS, or MA

*No course can count twice in the curriculum; that is, the courses selected as part of the 4/3 Technical, Analytics, and AI courses cannot also meet the MIS electives requirements.

Major Qualifying Project (3/3 Units)

The MQP must have a focus in the major (ISTech) area with an MQP advisor from the ISTech faculty in the Business School.

Free Electives (3/3 Units)

Course Flow Chart

(old chart removed, new chart on following page inserted)

INFORMATION SYSTEMS AND TECHNOLOGIES (ISTech)
OVERVIEW OF DEGREE REQUIREMENTS

UNIVERSITY REQUIREMENTS

HUMANITIES AND ARTS (6/3 Units): 6 courses including Inquiry Seminar/Practicum
SOCIAL SCIENCE (2/3 Units): ECON 1110 or 1120 or 2910 can be double-counted*
One from DEV, ECON, ENV, GOV, PSY, SD, SOC, SS, STS or ID 2050
PHYSICAL EDUCATION (1/3 Units)
INTERACTIVE QUALIFYING PROJECT (3/3 Unit)-3rd Year

MATHEMATICS AND SCIENCE REQUIREMENTS

BASIC SCIENCE (2/3 Units)
BB, CH, GE, PH
MATHEMATICS (4/3 Units)
Calculus - MA 1021; MA 1022; Statistics - MA 2611; MA 2612
COMPUTER SCIENCE (1/3 Units):
CS 1004 (recommended) or CS 1101 or CS 1102

CORE MANAGEMENT CURRICULUM (7/3 Units)

FINANCIAL COURSES (4/3 Units)

1. ACC 2060 Financial Statements for Decision Making
2. FIN 2070 Risk Analysis for Decision Making ***or***
   FIN 1250 Personal Finance ***or***
   OIE 2850 Engineering Economics
3. MIS 3010 Creating Value Through Innovation
4. ECON 1110 Introductory Microeconomics ***or*** ECON 1120 Introductory Macroeconomics ***or*** ECON 2910 Economics and Entrepreneurship*

MANAGERIAL COURSES (3/3 Units)

1. Any OBC course (OBC 1010 Leadership Practice recommended)
2. Any MKT course (MKT 4030 Achieving Strategic Effectiveness recommended)
3. Any course from: BUS, ETR, MKT ***or*** OBC. (BUS 1020 Global Environment ***or*** BUS 2020 Legal Environment recommended)

ISTECH CORE AND TECHNICAL, ANALYTICS AND AI CURRICULUM (7/3 Units)

ISTECH CORE COURSES (3/3 units)

1. MIS 3720 Business Data Management
2. MIS 4084 Business Intelligence ***or*** MIS 4741 User Experience and Design
3. MIS 4720 Systems Analysis and Design (take prior to MQP)

TECHNICAL, ANALYTICS, AND AI COURSES (4/3 units)

1. CS 2119 (to follow CS 1004) ***or***
   CS 2102/2103 (to follow CS 1101/1102)
2. BUS 2080 Data Analysis for Decision Making ***or*** OIE 2081 Intro. to Prescriptive Analytics
3. OIE 3020 Achieving Effective Operations
4. MIS 3787 Business Applications of Machine Learning ***or*** MIS 3730 Artificial Intelligence w. Business Application

ISTECH ELECTIVE OPTIONS (6/3 Units)

Select 6 courses from at least two of the groups below:**

- Analytics and AI electives: MIS 3787, MIS 3730, OIE 2081, OIE 3460, OIE 3510, OIE 4430
- FinTech electives: MIS 2300, FIN 3300, FIN 3310, FIN 3330
- User Experience electives: MIS 4741, MKT 3650, CS 3041
- Technical electives: Any courses with prefix CS (except CS 3043), DS, ***or*** MA

** No course can count twice in the curriculum; for example, the courses selected as part of the 4/3 Technical, Analytics, and AI courses cannot also meet the ISTech electives requirements.

MAJOR QUALIFYING PROJECT (3/3 Units)

The MQP must have a focus in the major (ISTech) area with an MQP advisor from the ISTech faculty in the Business School.

FREE ELECTIVES (3/3 Units)

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add EDU 500 Foundations of Integrated STEM Education

Motion: On behalf of the STEM Education Center, the Committee on Graduate Studies and Research recommends, and I move that EDU 500 Foundations of Integrated STEM Education, as described below, be added.

Proposed Course Description:

EDU 500: Foundations of Integrated STEM Education *(3 credits)*
This introductory online synchronous course surveys the landscape of PK-12 STEM education at the school, classroom, and learner levels. Students analyze research and STEM education frameworks to determine the critical elements of high-quality STEM related to teaching & learning, learner's mindset, agency, and identity. Students consider their own teaching & learning experience, learning theories, and best practices as they synthesize a personalized framework of high-quality STEM education pertaining to their own educational setting. A special emphasis is given to the problem-solving process (otherwise known as the "engineering design process"), stewardship to community & earth, and classroom climate, as students consider the desired outcomes of integrated STEM pedagogy.

Recommended Background: This course is intended for practicing PK-12 educators. Students who are aspiring educators or with prior teaching experience should consult with the program director prior to registration.

Anticipated Instructors: Mia Dubosarsky and Donna Taylor.

Rationale:
The proposed EDU 500 course will be a modified version of a SS 590 course that has been run in the past for middle school and high school teachers. EDU 500 will be the required first course for the future MS in Integrated STEM program and will be offered every year. This could be used as an elective in the current Master's in Mathematics for Educators, Master of Science in Mathematics for Educators (MMED), Master of Science in Physics for Educators (MPED), Learning Sciences, and other programs.

Resources Needed: None.

Implementation Date: AY 2024-2025.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add EDU 510 Classroom Climate that Supports Diverse STEM Learners

Motion: On behalf of the STEM Education Center, the Committee on Graduate Studies and Research recommends and I move that EDU 510 Classroom Climate that Supports Diverse STEM Learners, as described below, be added.

Proposed Course Description:

EDU 510: Classroom Climate that Supports Diverse STEM Learners *(3 credits)*
This online synchronous course addresses several elements of high-quality teaching, as well as laying the foundation for the variety of teaching & learning styles in different contexts (PreK-12 classrooms, out of school time settings, etc.). Students will discuss research related to family & community, culturally & linguistically sustaining practices, social & emotional learning, Universal Design for Learning, and engaging all learners in STEM. The course will also address different ways of knowing & learning and connecting STEM learning to learners' culture and place. Students will develop concrete plans to apply course topics into their practice, aligned with professional standards.

Recommended Background: This course is intended for practicing PK-12 educators. Students who are aspiring educators or with prior teaching experience should consult with the program director prior to registration.

Anticipated Instructors: Kathy Chen, Caitlin Keller, Donna Taylor, and other instructors from the STEM Education Center.

Rationale:
This course is designed specifically for K-12 and community college in-service educators. This could be used as an elective in the current Master's in Mathematics for Educators, Master of Science in Mathematics for Educators (MMED), Master of Science in Physics for Educators (MPED), Learning Sciences, and other programs. This course will serve as a core course for the future MS in Integrated STEM Education and could be taken as a stand-alone graduate course by full time educators. The course will be developed and facilitated by the STEM Education Center.

Resources Needed: None.

Implementation: AY 2024-2025.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add EDU 520 STEM and Project Based Learning Curriculum

Motion: On behalf of the STEM Education Center, the Committee on Graduate Studies and Research recommends and I move that EDU 520 STEM and Project Based Learning Curriculum, as described below, be added.

Proposed Course Description:

EDU 520: STEM & Project Based Learning Curriculum *(3 credits)*
This online synchronous course unpacks the elements of high-quality instructional materials (HQIMs), defined by the MA Department of Education and curricular materials exhibiting a coherent sequence of lessons that target learning of grade-appropriate and standards-aligned skills and knowledge through instructional strategies that are well supported by research and other characteristics such as engaging content and inclusive design. Students review, analyze, and identify high quality STEM curricula. Differences between STEM and project-based learning (PBL) curricular materials are discussed. Students review key literature on curriculum development through equity and justice frameworks (i.e. Understanding by Design, Science in the City). The final project includes the development/adaptation of a high-quality integrated STEM project aligned with State standards and practices, with key emphasis given to the process of creating standards-aligned learning targets.

Recommended Background: This course is intended for practicing PK-12 educators. Students who are aspiring educators or with prior teaching experience should consult with the program director prior to registration. Students enrolled in the MS for Integrated STEM program should take EDU 500 before or concurrent to this course.

Anticipated Instructors: Mia Dubosarsky, Donna Taylor, and other instructors from the STEM Education Center.

Rationale:
This course is designed specifically for K-12 and community college in-service educators. This could be used as an elective in the current Master's in Mathematics for Educators, Master of Science in Mathematics for Educators (MMED), Master of Science in Physics for Educators (MPED), Learning Sciences, and other programs. This course will serve as a core course for the future MS in Integrated STEM Education and could be taken as a stand-alone graduate course by full time educators.

Resources Needed: None.

Implementation: AY 2024-2025.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add EDU 530 Performance Assessments in STEM Education

Motion: On behalf of the STEM Education Center, the Committee on Graduate Studies and Research recommends and I move that EDU 530 Performance Assessments in STEM Education, as described below, be added.

Proposed Course Description:

EDU 530: Performance Assessments in STEM Education (3 credits)
In this online synchronous course, students unpack the elements of high-quality performance assessments that allow learners to demonstrate the knowledge and skills they have gained through a variety of methods. Approaches to grading and feedback to learners through an asset-based framework will be discussed. Students will analyze different types of rubrics and develop a standard-aligned rubric for a STEM project of their choice.

Recommended Background: This course is intended for practicing PK-12 educators. Students who are aspiring educators or with prior teaching experience should consult with the program director prior to registration. Students enrolled in the MS for Integrated STEM program should take EDU 500 before or concurrent to this course.

Anticipated Instructors: Mia Dubosarsky, Donna Taylor

Rationale:
This course is designed specifically for K-12 and community college in-service educators. This could be used as an elective in the current Master's in Mathematics for Educators, Master of Science in Mathematics for Educators (MMED), Master of Science in Physics for Educators (MPED), Learning Sciences, and other programs. This course will serve as a core course for the future MS in Integrated STEM Education and could be taken as a stand-alone graduate course by full time educators. The course will be developed and facilitated by the STEM Education Center.

Resources Needed: None.

Implementation: AY 2024-2025.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add EDU 540 Informal STEM Education

Motion: On behalf of the STEM Education Center, the Committee on Graduate Studies and Research recommends and I move that EDU 540 Informal STEM Education, as described below, be added.

Proposed Course Description:

EDU 540: Informal STEM Education (*3 credits***)**
This online synchronous course explores the differences between formal and informal (out-of-school-time) PreK-12 education. Students will review the role of informal STEM education on learners' motivation and aspiration towards STEM majors and careers, as well as the impact on learners' mindset and skills. This course will also review how global STEM competitions inspire students and help them develop key collaboration and problem-solving skills. An experiential component of 'STEM in the Community' will be included in this course.

Recommended Background: This course is intended for practicing PK-12 educators. Students who are aspiring educators or with prior teaching experience should consult with the program director prior to registration. Students enrolled in the MS for Integrated STEM program should take EDU 500 before or concurrent to this course.

Anticipated Instructors: Kathy Chen, Noemi Robertson

Rationale:
This course is designed specifically for K-12 and community college in-service educators. This could be used as an elective in the current Master's in Mathematics for Educators, Master of Science in Mathematics for Educators (MMED), Master of Science in Physics for Educators (MPED), Learning Sciences, and other programs. This course will serve as a core course for the future MS in Integrated STEM Education and could be taken as a stand-alone graduate course by full time educators. The course will be developed and facilitated by the STEM Education Center.

Resources Needed: None.

Implementation: AY 2024-2025.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add EDU 550 Collaboration and Teamwork in STEM Education

Motion: On behalf of the STEM Education Center, the Committee on Graduate Studies and Research recommends, and I move that EDU 550 Collaboration and Teamwork in STEM Education, as described below, be added.

Proposed Course Description:

EDU 550: Collaboration & Teamwork in STEM Education (*3 credits*)
In this online synchronous course students will review several theories related to teamwork and collaboration and the translation of these theories into successful practices in STEM education classes and the school as a workplace. Theories and strategies for improving team dynamics will be introduced, and participants will learn what factors are shown to lead to greater innovation and creativity on teams. We will also discuss implicit bias and stereotyping on teams, and how to prevent and minimize their negative impacts on participants. Multiple strategies for team formation in the classroom will be discussed, and we will explore how to teach students teamwork skills during project-based classes. The course will include an opportunity to apply some of the theories and strategies for effective and equitable teamwork in the classroom and to reflect on the utility of different approaches.

Recommended Background: None.

Anticipated Instructors: Anne Ogilvie

Rationale:
This course is designed specifically for K-12 and community college in-service educators. This could be used as an elective in the current Master's in Mathematics for Educators, Master of Science in Mathematics for Educators (MMED), Master of Science in Physics for Educators (MPED), Learning Sciences, and other programs. This course will serve as a core course for the future MS in Integrated STEM Education and could be taken as a stand-alone graduate course by full time educators. The course will be developed and facilitated by the STEM Education Center.

Resources Needed: None.

Implementation: AY 2024-2025.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add EDU 580 Special Topics in STEM Education

Motion: On behalf of the STEM Education Center, the Committee on Graduate Studies and Research recommends and I move that EDU 580 Special Topics in STEM Education, as described below, be added.

Proposed Course Description:

EDU 580: Special Topics in STEM Education *(3 credits)*
This online synchronous course explores key topics in the forefront of STEM education research and practice. Course offerings will change regularly and may include topics such as integrated STEM through robotics, Storyline model of teaching and learning, and more. Students may earn credit for multiple offerings of this course provided each offering bears distinct course descriptions and course content.

Recommended Background: Is determined based on the specific topic of the course. This course is intended for practicing PK-12 educators. Students who are aspiring educators or with prior teaching experience should consult with the program director prior to registration. Students enrolled in the MS for Integrated STEM program should take EDU 500 before or concurrent to this course.

Anticipated Instructors: Any instructor from the STEM Education Center and other WPI faculty.

Rationale:
This course is designed specifically for K-12 and community college in-service educators. This could be used as an elective in the current Master's in Mathematics for Educators, Master of Science in Mathematics for Educators (MMED), Master of Science in Physics for Educators (MPED), Learning Sciences, and other programs. This course will serve as a core course for the future MS in Integrated STEM Education and could be taken as a stand-alone graduate course by full time educators.

Resources Needed: None.

Implementation: AY 2024-2025.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add FP 582 Quantitative Risk Analysis

Motion: On behalf of the Department of Fire Protection Engineering, the Committee on Graduate Studies and Research recommends, and I move that FP 582 Quantitative Risk Analysis, as described below, be added.

Proposed Course Description:

FP 582: Quantitative Risk Analysis *(3 credits)*
This course will cover fundamentals of facility siting studies (FSS), quantitative risk assessments (QRA) and mitigation techniques. The primary objectives are to provide a thorough foundation and knowledge of the inputs, methodologies and typical types of results for FSS and QRAs. It will also provide knowledge of how QRAs can be used to identify and prioritize risk mitigation strategies to make informed and effective risk mitigation decisions. This course is ideal for PSM managers, process safety engineers, facility siting coordinators / SMEs, and anyone involved in the facility siting decision making process.

Anticipated instructor: TBD

Rationale:
Quantitative Risk Analysis is designed to equip participants with the essential skills and knowledge needed for conducting advanced facility siting studies (FSS), quantitative risk assessments (QRA), and implementing effective mitigation techniques. This course will deepen student's expertise in quantitative risk analysis and enhance their strategic impact on safety and risk management within their organizations. The course provides comprehensive understanding of the inputs and methodologies involved in FSS and QRAs, along with insight into the typical results that these assessments yield. The course is an example of theory with practice, where the fundamental skills learned in the foundational courses are now applied to practical engineering problems.

Resources Needed: This is a new graduate course and will be part of the normal load.
- Classroom/Zoom space for 25-30 people
- Laboratory: N/A
- Library resources: N/A
- Information Technology: N/A

Impact on Distribution Requirements and Other Courses: None

Implementation Date: First offering will be in Academic Year 2024 - 2025

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add FP 585 Explosion Dynamics

Motion: On behalf of the Department of Fire Protection Engineering, the Committee on Graduate Studies and Research recommends, and I move that FP 585 Explosion Dynamics, as described below, be added.

Proposed Course Description:

FP 585: Explosion Dynamics *(3 credits)*
This course will focus on fundamentals of explosions due to the combustion of flammable gas-air mixtures and combustible dust cloud Some generic questions that will be answered in an explosion dynamics context are: 1. How does a flammable mixture of gas or vapor or a suspension of powder or dust particles or droplets form in the industrial processing of these materials? 2. What are gas or dust cloud limits of ignitability, or in other words, what is the range of temperature, pressure, and concentration in which a flame can ignite and propagate? 3. What is the relationship between the flame propagation rate and the associated explosion pressure, and how is it influenced by the combustibility properties of the gas or dust cloud? 4. How does the "rate-of-pressure-rise" affect the overall explosion hazard and the viability of various explosion protection measures? 5. How does pressure development within the flammable gas or combustible dust cloud relate to the blast wave pressures propagating away from the cloud and away from the equipment in which the explosion originated? The course explains the physical and thermochemical phenomena pertinent to these questions and provides a mathematical framework for characterizing and applying the answers.

Anticipated instructor: TBD

Rationale:
This course on the fundamentals of explosions due to the combustion of flammable gas-air mixtures and combustible dust clouds is designed to deepen understanding and enhance safety in industrial environments. The course is necessary as it will provide the foundations of how to identify and manage conditions that may lead to industrial explosions, significantly improving workplace safety and preventing potential disasters. It will develop the scientific principles of flammable mixtures and dust clouds, including their limits of ignitability, the relationship between flame propagation rates and explosion pressures, and the dynamics of pressure rise.

Resources Needed: This is a new graduate course and will be part of the normal load.
- Classroom/Zoom space for 25-30 people
- Laboratory: N/A
- Library resources: N/A
- Information Technology: N/A

Impact on Distribution Requirements and Other Courses: None

Implementation Date: First offering will be in Academic Year 2024 - 2025

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add FP 588 Practical Explosion Analysis: Case Studies in Energy Industry

Motion: On behalf of the Department of Fire Protection Engineering, the Committee on Graduate Studies and Research recommends, and I move that FP 588 Practical Explosion Analysis: Case Studies in Energy Industry, as described below, be added.

Proposed Course Description:

FP 588 Practical Explosion Analysis: Case Studies in Energy Industry *(3 credits)*
This course will focus on new and renewable energy technologies, hydrogen, battery storage, electrical arc explosions, and transformer safety. Tailored for professionals navigating the evolving energy landscape, this course explores the fundamentals of explosions in unique applications in renewable energy facilities and the challenges posed by electrical arc explosions. The course is case study driven, where the lecturers will provide 5 – 6 in-depth case studies related to electrical arc explosions, explosions in batteries, hydrogen, and geothermal energy and explosion risks in space. Compliance measures are explored with a specific lens on the regulatory landscape governing these cutting-edge technologies. Practical components include emergency response planning, ensuring the safety and resilience of renewable energy assets, and addressing transformer explosion risks. Geared towards engineers, safety professionals, and managers in the energy industry, this course teaches participants to master explosion analysis and risk management tailored to the nuanced challenges of new energy technologies, including electrical arc explosions and transformer safety.

Anticipated instructor: TBD

Rationale:
The course will address the specialized needs of the rapidly evolving energy sector, particularly in new and renewable technologies. As these technologies, such as hydrogen fuel cells, battery storage systems, and electrical arcs, become more prevalent, the potential for unique and complex explosion risks also increases. This course provides essential knowledge and skills in identifying, analyzing, and mitigating these risks through a focused examination of real-world incidents. Through in-depth case studies and an examination of current regulatory frameworks, it equips energy professionals with the necessary tools to ensure compliance and enhance the safety and resilience of energy facilities. This training is indispensable for engineers, safety professionals, and managers tasked with the critical responsibility of managing explosion risks in advanced energy settings.

Resources Needed: This is a new graduate course and will be part of the normal load.
- Classroom/Zoom space for 25-30 people
- Laboratory: N/A
- Library resources: N/A
- Information Technology: N/A

Impact on Distribution Requirements and Other Courses: None

Implementation Date: First offering will be in Academic Year 2024 - 2025

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add CS 591 Fundamentals in Cyber Security for Teachers

Motion: On behalf of the Computer Science Department, the Committee on Graduate Studies and Research recommends, and I move that CS 591 Fundamentals in Cyber Security for Teachers, as described below, be added.

Proposed Course Description:

CS 591 Fundamentals in Cyber Security for Teachers *(3 credits)*
This course is focused on fundamentals of network and computer security with an emphasis on how intruders gain access to systems, how they escalate privileges, and what steps can be taken to secure a system against such attacks. Topics include computer networking basics, operating system basics, vulnerability, and attacks (social engineering, distributed denial of service attacks, buffer overflows, race conditions, trojans, and viruses), intrusion penetration, cyber defenses, network hardening, system hardening, and security administration. This course enrolls high school teachers based on their education, teaching, and/or professional experience. They must have earned the equivalent of a four-year U.S. bachelor's degree to be considered for enrollment. This course is not eligible for credit for the BS/MS programs (either via MS-CS or MS-SEC), MS-CS, MS-SEC, or PhD-CS degrees.

Rationale:
This class is needed to support the Graduate-level Certificate Program in Teaching Cyber Security for High School Teachers. It is necessary as a foundation course for K-12 teachers with less preparation in Computer Science and Cyber Security. Currently only students in this certificate program may use this course towards their degree. The course may not be used for any CS or Cyber degree programs.

Resource Needs and Anticipated Instructor: WPI has been granted funding from the NSA to initiate the inaugural offering for this course.

- *Instructor* – The course can be taught by any of the existing Computer Science Cyber Security faculty. The course can be offered with current faculty resources. As demand for the program grows, additional resources may be required.
- *Classroom and Laboratory* – This course can be taught in any standard classroom or online. The course does not have a laboratory component and does not require specific facilities.
- *Library Resources* – The course does not have special library resource requirements.
- *Information Technology* – This course may use the isolated computer network already present in Fuller Labs along with existing computation resources. No additional support or equipment is needed.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses and will have minimal impact on existing programs.

Implementation Date: The course would be added in the 2024-2025 academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add CS 592 Introduction to Digital Forensics for Teachers

Motion: On behalf of the Computer Science Department, the Committee on Graduate Studies and Research recommends, and I move that CS 592: Introduction to Digital Forensics for Teachers, as described below, be added.

Proposed Course Description:

CS 592 Introduction to Digital Forensics for Teachers *(3 credits)*
This course covers basic concepts and skills of digital forensics. Topics include the digital forensics profession, basic investigation procedure, legal aspects of forensics, setting up the forensic lab environment, evidence data acquisition, forensic analysis of different computer systems (Linux, Mac, and Windows), and data hiding techniques; projects involving using common digital forensic tools. This course enrolls high school teachers based on their education, teaching, and/or professional experience. They must have earned the equivalent of a four-year U.S. bachelor's degree to be considered for enrollment. This course is not eligible for credit for the BS/MS programs (either via MS-CS or MS-SEC), MS-CS, MS-SEC, or PhD-CS degrees.

Rationale:
This class is needed to support Graduate-level Certificate Program in Teaching Cyber Security for High Schools Teachers. Currently only students in this certificate program may use this course towards their degree. The course may not be used for any CS or Cyber degree programs.

Resource Needs and Anticipated Instructor: WPI has been granted funding from the NSA to initiate the inaugural offering for this course.

- *Instructor* – The course can be taught by any of the existing Computer Science Cyber Security faculty, adjunct faculty, and/or external contractors.
- *Classroom and Laboratory* – This course can be taught in any standard classroom or online. The course does not have a laboratory component and does not require specific facilities.
- *Library Resources* – The course does not have special library resource requirements.
- *Information Technology* **–** This course does not need additional support or equipment.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses and will have minimal impact on existing programs.

Implementation Date: The course would be added in the 2024-2025 academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add CS 593 Cyber Security Teaching Methods

Motion: On behalf of the Computer Science Department, the Committee on Graduate Studies and Research recommends, and I move that CS 593: Cyber Security Teaching Method, as described below, be added.

Proposed Course Description:

CS 593 Cyber Security Teaching Methods *(3 credits)*
This course is focused on introduction to existing generally accepted guidelines and frameworks (such as HSCCG, CSEC, CAE Knowledge Units, NCWF) in the discipline of cyber security. Methods for teaching cyber security to transform cyber security subject matter, with pedagogical content knowledge, into student learning. Topics include culturally-relevant methods, scaffolding knowledge, differentiation, assessment, and cyber security instructional technologies (ranges, CTFs, competitions, and unplugged activities). This course enrolls high school teachers based on their education, teaching, and/or professional experience. They must have earned the equivalent of a four-year U.S. bachelor's degree to be considered for enrollment. This course is not eligible for credit for the BS/MS programs (either via MS-CS or MS-SEC), MS-CS, MS-SEC, or PhD-CS degrees.

Rationale:
This class is needed to support Graduate-level Certificate Program in Teaching Cyber Security for High Schools Teachers. Currently only students in this certificate program may use this course towards their degree. The course may not be used for any CS or Cyber degree programs.

Resource Needs and Anticipated Instructor:
WPI has been granted funding from the NSA to initiate the inaugural offering for this course.

- *Instructor* – The course can be taught by any of the existing Computer Science Cyber Security faculty, adjunct faculty, and/or external contractors.
- *Classroom and Laboratory* – This course can be taught in any standard classroom or online. The course does not have a laboratory component and does not require specific facilities.
- *Library Resources* – The course does not have special library resource requirements.
- *Information Technology* **–** This course does not need additional support or equipment.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses and will have minimal impact on existing programs.

Implementation Date: The course would be added in the 2024-2025 academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add CS 594 Advanced Digital Forensics and Incident Response for Teachers

Motion: On behalf of the Computer Science Department, the Committee on Graduate Studies and Research recommends, and I move that CS 594 Advanced Digital Forensics and Incident Response for Teachers, as described below, be added.

Proposed Course Description:

CS 594 Advanced Digital Forensics and Incident Response for Teachers *(3 credits)*
This course focuses on providing students practical hands-on experiences on digital forensics, cyber-crime scene analysis and electronic discovery. Topics include technical methodologies and formal procedures for conducting forensic investigations; data acquisition, data recovery, file systems and storage analysis, file carving, data hiding and steganography, anti-forensics, network, and mobile forensics; projects involving using, understanding, and designing digital forensics tools. This course enrolls high school teachers based on their education, teaching, and/or professional experience. They must have earned the equivalent of a four-year U.S. bachelor's degree to be considered for enrollment. This course is not eligible for credit for the BS/MS programs (either via MS-CS or MS-SEC), MS-CS, MS-SEC, or PhD-CS degrees.

Rationale:
This class is needed to support Graduate-level Certificate Program in Teaching Cyber Security for High Schools Teachers. Currently only students in this certificate program may use this course towards their degree. The course may not be used for any CS or Cyber degree programs.

Resources Needed and Anticipated Instructor: WPI has been granted funding from the NSA to initiate the inaugural offering for this course.

- *Instructor* – The course can be taught by any of the existing Computer Science Cyber Security faculty, adjunct faculty, and/or external contractors.
- *Classroom and Laboratory* – This course can be taught in any standard classroom or online. The course does not have a laboratory component and does not require specific facilities.
- *Library Resources* – The course does not have special library resource requirements.
- *Information Technology* **–** This course does not need additional support or equipment.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses and will have minimal impact on existing programs.

Implementation Date: The course would be added in the 2024-2025 academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to establish a Graduate Certificate Program in Secure Programming

Motion: On behalf of the Computer Science Department, the Committee on Graduate Studies and Research recommends, and I move that a Graduate Certificate Program in Secure Programming be established, as described below.

Description of the Proposed Program – to be inserted in the WPI Graduate Catalog:

Graduate Certificate Program in Secure Programming

Program Goals and Objectives
With the growing demand for expertise in programming securely, the Graduate-level Certificate Program in Secure Programming provides participants with the depth of software security knowledge necessary to develop and implement code in a robust and secure way.

Admissions Requirements
This program enrolls participants based on their education and/or professional experience. Applicants must have earned the equivalent of a four-year U.S. bachelor's degree to be considered for enrollment.

Requirements for the Graduate-level Certificate Program in Secure Programming
The participants enrolled in this certificate program are required to complete the following four courses.

CS 509	Design of Software Systems
CS 557	Software Security Design and Analysis
CS 558	Computer Network Security
CS 571	Case Studies in Computer Security

Faculty Contacts: Jun Dai, Xiaoyan (Sherry) Sun, Craig Shue, Robert Walls, Craig Wills

Rationale:
The pervasive issue of poor software quality manifests in numerous ways, often resulting in inadequate responses to unexpected inputs or dynamic environments, ultimately leading to failures in both programs and systems. The consequences range from mere annoyances in personal computing to potentially catastrophic compromises in critical infrastructure. One emblematic case of this is the Heartbleed vulnerability discovered in OpenSSL back in 2014 [1].

OpenSSL, a widely used version of SSL/TLS, suffered from a critical vulnerability that permitted unauthorized access to the buffer of a previous user's connection due to a failure in bounds validation. What exacerbated the situation was OpenSSL's extensive adoption across commercial and financial sectors, with estimates suggesting it was employed by about 66% of all web servers, including those of major corporations [2]. This vulnerability underscored the perils of overlooking security measures in software development, particularly in widely used and impactful applications.

While some may argue that oversights like these are understandable, given that OpenSSL was maintained by volunteers with day jobs, it underscores a broader issue within the software industry: the pressure to rush products to market often leads to compromises in quality and security. The prevailing mindset of "patching later" rather than "building securely from the start" is a dangerous precedent, as noted by Bishop (2002) [3].

The ramifications of this approach extend beyond individual software vulnerabilities. They permeate the industry's hiring practices, where job advertisements rarely prioritize expertise or knowledge in secure programming. Consequently, aspiring programmers, driven primarily by employability concerns, may overlook the importance of developing secure programming skills.

This oversight has profound implications, particularly in critical infrastructure sectors. Malicious actors exploit vulnerabilities in industrial control systems with devastating consequences. For instance, malware such as Triton, Pipedream, and Blackenergy have successfully targeted programmable ladder controllers (PLCs) and industrial control systems (ICS), leading to disruptions in power stations in countries like India and Ukraine [4].

Stuxnet serves as a poignant example of the sophistication of such attacks [5]. This malware was designed to target a specific make and model of centrifuge within industrial control systems. If unsuccessful, it would attempt to propagate through networked PCs, highlighting the need for comprehensive security measures across interconnected systems.

Recognizing the urgent need to address these challenges, a proposal for a 12 credit-hour **Graduate-level Certificate Program in Secure Programming** is put forth. This program aims to equip participants with the skills necessary to anticipate and mitigate vulnerabilities in software development, thereby bolstering the workforce's capability to build secure and resilient systems. Through initiatives like these, it is expected that the industry can shift towards a proactive approach to software security, safeguarding both digital infrastructure and societal well-being.

Secure programming is a critical skill. Programmers who know the principles and how to apply them will produce more robust programs and systems than those who do not. Ideally, this style of programming would be integrated into all classes that involve programming. But that has not yet happened. This "Graduate-level Certificate Program in Secure Programming" provides participants an opportunity to get software security training at graduate level and become qualified to enter the secure programming workforce. This helps address market demand, satisfying the high demands of the cybersecurity workforce in this field. Learners will discover the principles and methods of secure programming at the level of their programming skill. In this way, this certificate program can contribute to the hardening of our systems and infrastructure, and the general improvement of the state of programming in the cybersecurity workforce.

Comparison to Existing Programs at WPI: This proposed certificate will be one that fits under the existing CS certificates [6] as an additional defined certificate type. The graduate catalog edits should just be to add those four courses in that section of the catalog.

Impact on Existing Programs at WPI: The participants enrolled for the proposed certificate can become potential applicants for MS-SEC degree or similar, as it is very natural for them to consider taking more credits to obtain a Master or PhD degree after finishing the certificate program.

Resources Required: The courses required for this certificate are already part of our regular offerings, thus needing no additional resources for its creation. WPI has been granted funding from the NSA to initiate the inaugural cohort for this certificate. Delivery methods for these courses can be flexible, whether online or in-person, contingent upon scheduling decisions made by the department. Moreover, instruction may be provided by various faculty types, including full-time, adjunct, or external contractors.

Program Management: The program will be led by the Computer Science faculty specialized in secure programming education, Jun Dai and Xiaoyan Sun, who will manage admissions to the program.

Implementation Date: Targeted start for implementation is the 2024-2025 academic year.

References:

[1] CVE-2014-0160, National Vulnerability Database. https://nvd.nist.gov/vuln/detail/cve-2014-0160. Accessed in April, 2023.

[2] "The Heartbleed Bug", Synopsys, Inc. https://heartbleed.com/. Accessed in April, 2023.

[3] Matt Bishop, 2002. Computer Security: Art and Science, Section 20.1.2.2.

[4] "Cyber Attacks on the Power Grid", IronNet Threat Research. https://www.ironnet.com/blog/cyber-attacks-on-the-power-grid. Accessed in April, 2023.

[5] Ralph Langer, "Stuxnet: Dissecting a Cyberwarfare Weapon," IEEE Security and Privacy, 9(3) pp. 49–52 (May 2011); DOI 10.1109/MSP.2011.67.

[6] WPI Computer Science Certificates. https://www.wpi.edu/academics/study/computer-science-certificate.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to establish a Graduate Certificate Program in Teaching Cyber Security for High School Teachers

Motion: On behalf of the Computer Science Department, the Committee on Graduate Studies and Research recommends, and I move that a Graduate Certificate Program in Teaching Cyber Security for High School Teachers be added, as described below.

Description of the Proposed Program – to be inserted in the WPI Graduate Catalog:

Graduate Certificate Program in Teaching Cyber Security for High School Teachers

Program Goals and Objectives
With the growing demand for expertise in Cyber Security, the Graduate-level Certificate Program in Teaching Cyber Security for High Schools provides teachers with the depth of cyber security knowledge necessary to develop and implement stand-alone high school cyber security courses that best impact student learning outcomes.

Admissions Requirements
Applicants must have earned the equivalent of a four-year U.S. bachelor's degree to be considered for enrollment. This program is expected to enroll high school teachers based on their education, teaching, and/or professional experience.

Requirements for the Graduate-level Certificate Program in Teaching Cyber Security for High Schools
The students enrolled in this certificate program are required to complete the following six courses, which are expected to primarily be offered online during the summer session.

CS 571	Case Studies in Computer Security
CS 587	Cyber Security Capstone Experience
CS 591	Fundamentals in Cyber Security for Teachers
CS 592	Introduction to Digital Forensics for Teachers
CS 593	Cyber Security Teaching Methods
CS 594	Advanced Digital Forensics and Incident Response for teachers

This certificate is designed to require 18 credit hours (i.e., 6 courses), as many states require 18 credit hours in order for teachers to teach dual credit.

Faculty Contacts: Xiaoyan (Sherry) Sun, Jun Dai, Craig Shue, Robert Walls, Craig Wills

Rationale:
According to the report on cyber security workforce demand updated June 2023 by National Initiative in Cybersecurity Education (NICE, nist.gov/nice), there is a global shortage of 3.4 million cyber security professionals [1]. These unfilled positions are of paramount importance in safeguarding critical sectors, including finance, health, manufacturing, insurance, public policy, and defense. As a result, organizations face security breaches that impose annual financial costs on the global economy, amounting to hundreds of billions of dollars. The demand for a strong cyber security workforce is huge and growing dramatically.

The cyber security community has proposed efforts to fill the cyber security workforce gap with a primary focus on college students, at both undergraduate and graduate levels. Extending the efforts to involve high schools is crucial, as it can introduce cyber security education at an earlier stage, stimulating students' interest in the field when/before they start choosing their majors and envisioning themselves in potential career paths. This is evidenced by the College Board's 2024-2025 pilot in inaugural Career Kickstart Cybersecurity pathway and its Networking Fundamentals and Cybersecurity Fundamentals courses [2]. College Board is the non-profit organization that clears a path for all students to own their future through the AP Program, SAT Suite, and more.

However, very few teachers in high schools are qualified to teach Computer Science (CS), let alone cyber security. Many of the cyber security activities are outside of the school day, relying on extracurricular efforts (such as CyberPatriot) of the students or coaches with special interest in security. Most of the K-12 schools suffer from a serious lack of cyber security teachers, coaches, or mentors, and hence students in these schools are generally not exposed to cyber security study.

To help address this teacher shortage, we propose to launch a 18 credit-hour **Graduate-level Certificate Program in Teaching Cyber Security for High School Teachers**, which is designed to upskill high school teachers with interest in cyber security. Beyond just providing professional development opportunities (such as camps and seminars) to high school teachers, the certificate program provides the depth of knowledge and skills needed for teachers to implement cyber security courses, programs, and pathways. Ascribing to the philosophy that it is better to teach teachers how to fish (i.e., understand cyber security fundamentals and then design the curriculum on their own), than giving them a fish (i.e., directly provide them the cyber security curriculum), the program is focused on building teachers' knowledge and skills in cyber security and providing them a cyber security credential.

This "Graduate-level Certificate Program in Teaching Cyber Security for High Schools" provides high school teachers an opportunity to get cyber security training at graduate level and become qualified to teach and develop cyber security courses/programs at high school. This helps address market demand, satisfying the upcoming high teacher demands. Fostering cyber security education in high schools and administering early college credits about cyber security is becoming the national trend. WPI is now at the frontier of this effort, and establishing the certificate program will help draw substantial resources from federal government agencies advocating this effort. Further, it will benefit by creating a pipeline to attract high school students to enter WPI for cyber security study, contributing to filling the cyber security workforce gap. With this program, WPI will also have a potential pathway for high school teachers to pursue MS-degree study in Computer Science/Cyber Security or in STEM Education.

New Course Descriptions:
The following new courses are proposed for this new certificate program:

- CS 591 Fundamentals in Cyber Security for Teachers
- CS 592: Introduction to Digital Forensics for Teachers
- CS 593: Cyber Security Teaching Methods
- CS 594: Advanced Digital Forensics and Incident Response for Teachers

The motions to add these courses and the rationale for doing so are included in a separate set of motions.

Comparison to Existing Programs at WPI
This program is different from the following MS degree or certificate programs.
Master of Science in Cyber Security (MS-SEC), with both on-campus and online delivery. The MS-SEC is master's degree that allows students to choose a path of study that focuses on applying security techniques, researching new techniques, or combining research with application. This program builds upon WPI's existing expertise in cyber security across the Computer Science, Electrical and Computer Engineering, and

Mathematical Sciences departments and the School of Business. MS-SEC is designed to appeal to students from a variety of majors with varying degrees of technical preparation.

The Master of Science in Computer Science (MS-CS) degree has a specialization option in Computer Security. The MS-CS degree requires an undergraduate preparation in Computer Science. It requires technical expertise in algorithms and computational theory. Such expertise is not required for many cyber security career options and greatly narrows the pool of applicants that could complete such a degree. Further, Computer Science often involves the creation of new abstractions, software, and research.

The Master of Science in Information Technology (MS-IT) degree is focused on integrating technology into business. It provides students with an understanding of computing applications and relates them to organizational needs. The Information Security Management Graduate Certificate requires two courses, "Risk Management and Decision Analysis" and "Information Security Management," which focus on organizations and security. The certificate also requires two additional courses from the broader School of Business.

The Master of Science in Electrical and Computer Engineering (MS-ECE) includes courses in cryptography, blockchain security, machine learning security, and hardware security. The MS-ECE requires mathematical expertise that is not required in this program.

Impact on Existing Programs at WPI: The teachers enrolled for the proposed certificate program can become potential applicants for MS-SEC degree or similar, including the under-development master's in integrated STEM Education for K-12 teachers, as it is very natural for them to consider taking more credits to obtain a master's degree after finishing the certificate program.

Resources Required: WPI has been granted funding from the NSA to initiate the inaugural cohort for this certificate. The grant will cover administration of the certificate as well as offering courses not already being taught at WPI. If enrollment in the certificate program warrants, then offering for courses beyond the lifetime of the grant will continue. Delivery methods for these courses will be online only, giving maximum flexibility to accommodate the schedules of high school teachers nationwide. Moreover, instruction may be provided by various faculty types, including full-time, adjunct, or external contractors.

Program Management: The program will be led by the Computer Science faculty specialized in cyber security K-12 education, Xiaoyan Sun and Jun Dai, who will manage admissions to the program.

Implementation Date: Targeted start for implementation is the 2024-2025 academic year.

References:

[1] National Institute of Standards and Technology, "Cybersecurity Workforce Demand," Feb 6, 2024. [Online] https://www.nist.gov/system/files/documents/2023/06/05/NICE%20FactSheet_Workforce%20Demand_Final_20211202.pdf.

[2] College board, "Career Kickstart," Feb 6, 2024. [Online] https://apcentral.collegeboard.org/about-ap/outreach-and-collaborations/career-kickstart.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add BUS 597 Independent Study

Motion: On behalf of the Business School, the Committee on Graduate Studies and Research recommends and I move that BUS 597 Independent Study, as described below, be added.

Proposed Course Description:

BUS 597 Independent Study *(Cr: Variable)*
This course will allow a student(s) to study a certain business-related topic under the guidance of an affiliated WPI Business School faculty member. The student must produce an appropriate deliverable from this experience to satisfy the course requirement.

Rationale:
This course will serve as an independent study for the WPI Business School students.

Impact on Degree Requirements: None

Resources and Anticipated Instructors: No additional resources needed.

Implementation Date: 2024-2025 Academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify the course title and description of BUS 598 Independent Study

Motion: On behalf of the Business School, the Committee on Graduate Studies and Research recommends and I move that the course title and description of BUS 598, Independent Study be modified as described below.

Description of the Proposed Modifications:

Current course title and description:

BUS 598: Independent Study *(Cr: 1-3)*
The student should have a well-developed proposal before approaching a faculty member about an independent study.

Proposed course title and description:

BUS 598: Special Topics *(Cr: 1-3)*
This course will engage students at an advanced level in the exploration of special topics that reflect the expertise of the business school's faculty. It will serve as a flexible vehicle to provide a course offering of topics of current interest as well as to offer new topics before they are made into a permanent course. The course content and format vary to suit the interests and needs of the faculty and students.

Rationale:
This course will serve as a special topics course for the WPI Business School. A title and description are being modified to keep it consistent with the other WBS special topics courses in the graduate catalog. Credits are being modified to offer flexibility to the student, faculty, and department while launching future special topics courses.

Impact on Degree Requirements: None

Resources: No additional resources are required.

Implementation Date: 2024-2025 Academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify the course description of MIS 585 User Experience Design

Motion: On behalf of the Business School, the Committee on Graduate Studies and Research recommends and I move that the course description of MIS 585 User Experience Design be modified, as described below.

Description of the Proposed Modifications:

Current course description:

MIS 585: User Experience Design *(Cr: 3.0)*
Designing positive user experiences is becoming increasingly important in staying competitive in the marketplace. This UX Design course offers students hands-on experiences, through the use of real-world projects, that provide them with a strong portfolio of work that showcases their skills in UX/UI, visual, service, experience, and product design. Throughout this course, students will create innovative experiences that enrich their technical fluency in both web and interactive development. The course provides a foundation in art and design in order to help students articulate their work to stakeholders and translate outcomes as business value.

Proposed course description:

MIS 585: User Experience Design *(Cr: 3.0)*
Creating value through designing positive user experiences is increasingly important for staying competitive in the marketplace. This course covers best practices for designing innovative user-centered product and service experiences that resonate with users. Through a series of hands-on projects, students will develop practical skills in showcasing the inherent value of their user-centered designs to stakeholders. Emphasis will be placed on constructing portfolios that effectively demonstrate the value of their designs and translate their design outcomes into tangible business results.

Department: Management Information Systems

Rationale:
The course description is being changed to reflect the current course contents more accurately. The course now focuses on design and best practices for designing innovative user experiences for products and services. For example, the module in art is replaced with the more advanced UX techniques, such as the use of eye tracking, for developing and testing visual designs. Because of these major changes, a revised course description is needed.

Impact on Degree Requirements: None. The course retains the same number and title, and there are no changes in where the course fits in the curriculum.

Resources: No additional resources are required.

Implementation Date: 2024-2025 Academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to reduce credit requirements for the Master of Fine Arts in IMGD

Motion: On behalf of the Interactive Media and Game Development Program, the Committee on Graduate Studies and Research recommends and I move that the requirements for the Master of Fine Arts in Interactive Media and Game Development be modified, as described below.

Proposed Modifications to Graduate Catalog:
(currently on p. 221-222 of 23-24 WPI Graduate Catalog)

On the "M.F.A. in Interactive Media and Game Design" catalog page, the following modifications should be made that remove the Professionalization requirement, and remove mention of it or the "three year program" throughout. (with red text to be added, and ~~red struckthrough~~ text to be deleted)

Curriculum
The MFA requires ~~51~~ 45 credit hours, spread across Design Studio (12 credit hours), Core Coursework (21 credit hours), ~~a professionalization requirement (6 credit hours),~~ an elective (3 credit hours), and a thesis project (9 credit hours).

Exit Requirements
1. Capstone project
2. Public presentation of capstone project
3. Portfolio ~~(as a requirement of IMGD 6001, Job Colloquium)~~

Design Studio
~~IMGD Studio is taken every semester of the three year program.~~ Students should complete four offerings of IMGD Studio.

IMGD 5000	IMGD Studio	3
Minimum Credits		**12**

~~**Professionalization**~~
~~One IMGD Colloquium course is taken every year of the three year program. IMGD 6001 should be taken in the student's final year.~~
~~Three credits of graduate internship OR Completion of a Teaching Certificate~~

~~IMGD 6000~~	~~IMGD Colloquium~~	~~1~~
~~IMGD 6001~~	~~IMGD Career Colloquium~~	~~1~~
~~**Minimum Credits 6**~~		

Rationale:

Overview: This motion will remove the "Professionalization" section from the IMGD MFA degree requirements, as well as its associated six credits, and in doing so reduce the required credits for the degree from 51 credits to 45 credits. This reduces the time needed to complete the degree from 3 years to 2.5 years. The credit reduction places the IMGD MFA more in line with its peer programs.

Detailed Rationale: After our initial three years of experience running the MFA and graduating our first MFA student, we have seen students finding alternative opportunities for professionalization than those mandated by the current degree requirements. These opportunities have included student assistantships, summer teaching opportunities through Frontiers and undergraduate summer courses, and close faculty mentorship. Further, the courses that previously fulfilled this requirement (IMGD 6000, IMGD 6001) are

now offered as regular, co-curricular, program-wide offerings that have proved both sustainable and popular without graduate-level course credit attached. By removing the professionalization degree requirement, we are not removing professionalization opportunities. And the academic core of the degree---studying human-centered experience design and interaction design in the context of the arts--remains in place.

WPI IMGD is an internationally ranked program (top 20 graduate programs in interactive media and games) and offers a unique opportunity for graduate students to join a multidisciplinary cohort of graduate students pursuing MS, MFA, and PhD degrees. This is appealing to prospective students, and we are seeing high demand and interest from students pursuing an MFA at a technical university. Prospective students see the appeal of furthering their training in art and design at a university that has such strength in both development and application of advanced technologies.

However, recruitment has been a challenge given our increased cost due to the credit hour requirement. At WPI, most MFA students are unfunded, a situation that is not uncommon with MFA degrees; for example, the website https://profellow.com only lists 94 fully-funded MFA programs in the United States, across a wide range of disciplines including creative writing, acting, visual arts, music, and more.

Lowering the number of required credits will also make the degree more financially viable and in line with our peer institutions (e.g. the MFA in Interactive Media at Clark University is 45 credits). It will also reduce the time expected to complete the degree to 2.5 years, which brings us closer in line with most games and interactive media-focused MFA programs. NYU, Clark, UCSC, and UT Dallas all have 2 year programs; Champlain has 2 years plus one summer.

Resources Needs: No additional resource needs are anticipated.

Implementation Date: 2024-2025 Academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add a Bachelors/Masters option in the MFA Program in IMGD

Motion: On behalf of the Interactive Media and Game Development Program, the Committee on Graduate Studies and Research recommends, and I move that a Bachelors/Masters option be added to the MFA Program in IMGD.

Description of the Motion - Additions to Graduate Catalog:
(Add this new section; not currently in grad catalog)

Create a new program page in the graduate catalog titled:
"**Bachelors/MS or Bachelors/MFA in IMGD**", with button text labeled "Bachelors/Masters". Catalog page content should read as follows:

Students who complete their undergraduate degree at WPI are eligible to apply credits from their undergraduate degree towards an IMGD MS or IMGD MFA degree. The maximum number of credits allowable is 40% of the credit requirement for the Masters degree, i.e. 12 graduate credits in the Master of Science, or 18 graduate credits in the Master of Fine Arts.
These credits may include any IMGD 4000-level courses or higher, each of which can count for two credits toward the graduate degree. It is common for students to take an additional one credit of related independent study with the instructor during or after completing an undergraduate course that they plan to double-count for graduate credit. However, this is at instructor discretion.

Course Equivalencies
Some IMGD undergraduate and graduate courses have significant overlapping material. The undergraduate version of these courses will count for the course requirement at the graduate level, though bearing 2 credits rather than 3. A student who takes the 4000-level course and counts it as part of their graduate degree should not also take the graduate version, and instead should replace the missing credits with additional electives or independent study.

Undergraduate	Graduate
IMGD 4200: History and Future of Immersive and Interactive Media	IMGD 5200: History and Future of Immersive and Interactive Media
IMGD 444x: Advanced Topics in Interactive Media: Production	IMGD 5400: Production Management for Interactive Media
IMGD 4600: Serious Games	IMGD 5500: Serious and Applied Games

Bachelors/Master of Fine Arts
Students pursuing a Bachelors/Master of Fine Arts degree may petition the IMGD graduate committee to double-count either 4000-level classes that are not IMGD courses or MQP credits as either electives or replacements for IMGD MFA degree requirements. Such courses or MQP credit should be related to the students' proposed vision for their MFA, and students should include this reasoning in their petition.

Admissions Guidelines
Students interested in pursuing a Bachelors/Masters in IMGD are advised to apply at the end of their junior year of undergraduate study, in order to best plan coursework in their senior year to support overlapping degree requirements. Applications are submitted through WPI graduate

admissions office, and Bachelors/Masters students will need to complete all admission requirements specified in the catalog for their chosen degree. Additionally, students will need to complete paperwork with the registrar's office designating which courses they intend to double-count from their undergraduate degree.

Rationale:

Overview: This motion will introduce a comprehensive "Bachelors/Masters" page to the IMGD catalog that details options for both the IMGD MS and the IMGD MFA. This is already an option for the MS, which is quite popular, and the motion introduces a Bachelors/Masters option for the MFA. To keep this information clear and well-defined in the catalog, we propose creating a Bachelors/Masters page that lists all the rules for IMGD Masters programs, rather than scattering them across degree definitions.

Detailed Rationale: We have active interest from current undergraduate students at WPI to complete their MFA; these students are currently incorrectly incentivized to go to the MS due to the lower costs associated with the Bachelors/Masters program. Adding a Bachelors/Masters program for the MFA will support these students in seeking a more affordable graduate education that better matches their professional goals.

This text makes it explicit that WPI students can double count credits from their undergraduate studies towards the IMGD MFA degree. The eighteen credits of double counting allowed (of forty-five total) matches the percentage of credits that can double count in BA/BS/MS programs at WPI (forty percent, or twelve out of thirty).

Creating a single catalog page for Bachelors/Masters programs consolidates information in one place, as the majority of rules for Bachelors/Masters are the same between the two degrees. It also makes clearer in the new online catalog that the option exists. A paired motion will remove existing BS/MS language from the MS IMGD page of the catalog.

Resources Needs: No additional resource needs are anticipated.

Implementation Date: 2024-2025 Academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify the graduate catalog description of the BS/MS Program in IMGD

Motion: On behalf of the Interactive Media and Game Development Program, the Committee on Graduate Studies and Research recommends, and I move that the graduate catalog description of the BS/MS Program in IMGD be modified as described below.

Proposed Modifications to Graduate Catalog:
(pg. 223 of 23-24 WPI Graduate Catalog)

Modify the MS in Interactive Media and Game Development degree requirements page as follows: (with red text to be added, and ~~red struckthrough~~ text to be deleted)

> **Degree Requirements**
> IMGD M.S. students undertake a ~~Game Design Studio~~ studio course (3 credit hours), core courses relevant to their interests (12 credit hours), and two elective courses selected by the student and approved by the advisor (6 credit hours). Each student is required to complete either a Master's thesis (a systematic approach to addressing an identified research question, typically done individually) or a Master's project (a substantial development effort that follows a production plan to implement a design vision, typically done in teams) to complete the degree requirements (9 credit hours).
> ~~The IMGD program also offers a B.S./M.S. program for current IMGD undergraduate students. Students enrolled in this program may count up to 12 credit hours of specific undergraduate courses towards both their B.S. and M.S. degrees.~~

Rationale:
The BS/MS option is **not** being removed; language describing it is merely moving to a different location in the catalog. As such, the language in this portion of the catalog is redundant and outdated, and should be removed.

This motion removes outdated and unnecessary language from the graduate catalog related to the IMGD BS/MS offering, as it has now been superseded by the introduction of a "Bachelors/Masters" page that covers both the MS and MFA.

This motion also changes two lingering typos in the Degree Requirements section.

Resources Needed: No additional resource needs are anticipated.

Implementation Date: The implementation date for this action is the 2024-2025 academic year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify the M.S. degree and B.S./M.S. program requirements in Bioinformatics and Computational Biology

Motion: On behalf of the Program in Bioinformatics and Computational Biology, the Committee on Graduate Studies and Research recommends, and I move, that the requirements for the M.S. degree and B.S./ M.S. program in Bioinformatics and Computational Biology be modified as described below.

Description of the Motion:

Summary:
We propose the following changes to the M.S. and B.S. / M.S. degrees in BCB:

- Change the credits for an internship from 6-9 credits to 3 credits, to be in compliance with WPI guidelines
- Change the total number of credits for the MS from 33 to 30, to be more consistent with other MS degrees offered by WPI and make our program more competitive nationally
- Clarify the requirements for the thesis and internship options for the MS
- Modify the ethics requirement
- Clarify the coursework requirements for the degree, and update the approved course lists to delete courses that are no longer offered and add courses that have been approved since the Program was created

Proposed Modifications to the WPI Graduate Catalog: (pp. 218-219)
The current and proposed M.S. and B.S./M.S. requirements are shown below. (with red text to be added, and ~~red struckthrough~~ text to be deleted)

M.S. in Bioinformatics and Computational Biology
Students pursuing the M.S. degree in Bioinformatics and Computational Biology (BCB) must complete a minimum of ~~33~~30 credits of relevant work at the graduate level. These ~~33~~30 credits must include a ~~satisfy the 6-~~9 credit M.S. thesis or 3 credit internship as described below. ~~requirement.~~ . Coursework requirements include competency in each of the areas of biology, computer science, mathematics, and interdisciplinary studies in bioinformatics / computational biology, as well as ~~more advanced~~elective courses and an ethics course.

The M.S. degree requirements have been designed to provide a comprehensive yet flexible program to students who are pursuing an M.S. degree exclusively, students who are pursuing a combined B.S./M.S. degree, and students who are pursuing a combined M.S. / Ph.D. degree.

Upon acceptance to the M.S. program, students will be assigned an academic advisor. In consultation with the academic advisor, the student must prepare a Plan of Study outlining the selections that the student will make to satisfy the M.S. degree requirements. This Plan of Study must then be approved by the BCB Graduate ~~Review~~ Committee, which consists of faculty members ~~from each of the three participating WPI departments~~affiliated with the Program.

B.S./M.S. in Bioinformatics and Computational Biology
Students enrolled in the B.S./M.S. program must satisfy all the program requirements of the B.S. degree and all the program requirements of the M.S. degree. They may double-count 4000-level or graduate courses whose credit hours total no more than 40% of the ~~33~~30 credit hours required for the M.S. degree, and that meet all other requirements for each degree, towards both their undergraduate and graduate degrees.

Students must register for B.S./M.S. credit prior to taking the courses, as faculty may assign extra work for those taking the course as part of both degrees.

In consultation with the academic advisor, the student must prepare a Plan of Study outlining the selections that the student will make to satisfy the B.S./M.S. degree requirements, including the courses that the student will double count. This Plan of Study must then be approved by the Graduate ~~Review~~ Committee. Students must consult their advisors and the graduate catalog, as individual departments may have restrictions on which under-graduate courses might be taken for graduate credit, and on which pairs of undergraduate and graduate courses cannot both be taken for credit.

MS Thesis / Internship
A student in the M.S. program must complete at least one of the following two options:

- *MS Thesis:* A 9-credit thesis. The thesis, consisting of a research or development project, must be advised or co-advised by a faculty member affiliated with the BCB Program. At the initiation of the thesis, in consultation with their advisor(s), students must choose another BCB-affiliated faculty member to approve the thesis topic and agree to be a reader. Theses are typically carried out over at least two semesters. At the conclusion of the thesis project, students submit their thesis document to their advisor(s) and reader and present their work at a seminar. Students funded by a teaching or research assistantship must complete the thesis option.

- *MS Internship:* A ~~6-9~~ 3 credit research or practice-oriented internship. The internship is carried out in cooperation with a sponsoring organization or affiliated research lab, and must be approved and overseen by a faculty member affiliated with the BCB Program. At the conclusion of the internship, students submit a short report to their advisor and a BCB-affiliated faculty member reader and present their work at a seminar.

Coursework Requirement (~~24-27~~21 credits for the thesis option; 27 credits for the internship option)
A student in the M.S. program must take courses to satisfy each of the following four requirements:

- 6 graduate credits of BCB interdisciplinary courses from the list below.
- 3 graduate credits in each of the 3 related areas (BBT, CS, MA) from the corresponding lists below (9 credits total; typically 3 or 4 courses).
- ~~1~~0-3 graduate credits in ~~social implications or bioethics (typically BB 551 or CS 3043)~~ responsible conduct of research, ~~social implications~~ ~~bioethics,~~ research integrity in the sciences, or ethics in artificial intelligence courses chosen from the list below.
- Program electives to satisfy the remainder of the ~~33~~30 total credit requirement for the degree. An elective can be any graduate course listed below, except for ethics courses. Other graduate courses, graduate research credits, or ISGs may be used with prior approval of the Program's ~~Review~~Graduate Committee.

Bioinformatics and Computational Biology Interdisciplinary courses:
BCB 501 Bioinformatics
BCB 502 Biovisualization
BCB 503 Biological and Biomedical Database Mining
BCB 504 Statistical Methods in Genetics and Bioinformatics
BCB 590 Special Topics

Relevant Biology & Biotechnology, and Chemistry & Biochemistry Graduate Courses:
BB 504 Molecular Biology of the Cell
BB 526/4260 Synthetic Biology
BB 550/4050 Cancer Biology

BB 552 Scientific Writing and Proposal Development
BB 553 Experimental Design and Statistics in the Life Sciences
BB 554 Journal Club.
BB 561 Model Systems: Experimental Approaches and Applications.
BB 562 Cell Cycle Regulation
~~BB 565 Virology~~
~~BB 570 Special Topics: Molecular Biology of the Cell~~
BB 570 Special Topics
BB 575 Advanced Genetics and Cellular Biology
BB 590 Advanced Topics in Biology and Biotechnology

CH 538 Medicinal Chemistry
CH 540 Regulation of Gene Expression
CH 541 Membrane Biophysics
CH 542 Drugs in the Brain
CH 545 Plant Natural Products
CH 554 Molecular Modeling
CH 555 Special Topics

Relevant Computer Science Graduate Courses:
CS 5007 Introduction to Applications of CS with Data Structures and Algorithms
CS 5084 Introduction to Algorithms: Design and Analysis
CS 504 Analysis of Computations and Systems
CS 509 Design of Software Systems
CS 522 / MA 510 Numerical Analysis
CS 531 System Simulation
CS 534 Artificial Intelligence
CS 539 Machine Learning
CS / DS 541 Deep Learning
CS 542 Database Management Systems
CS / DS 547 Information Retrieval
CS 548 Knowledge Discovery and Data Mining
CS 561 Advanced Topics in Database Systems
CS 573 Data Visualization
CS 584 Algorithms: Design and Analysis
CS 585/DS 503. Big Data Management
CS 586/DS 504. Big Data Analytics
(Note: Students cannot receive credit for both CS5084 and CS584.)

Relevant Mathematics Graduate Courses:
MA 500 Basic Real Analysis
MA 501 Engineering Mathematics
MA 508 Mathematical Modeling
MA 510 / CS 522 Numerical Methods
MA 511 Applied Statistics for Engineers and Scientists
MA 517 / DS 517 Mathematical Foundations for Data Science
MA 528 Measure Theoretic Probability Theory
MA 529 Stochastic Processes
MA 540/4631 Probability and Mathematical Statistics I
MA 541/4632 Probability and Mathematical Statistics II

MA 542 Regression Analysis
MA 543/ DS 502 Statistical Methods for Data Science
MA 546 Design and Analysis of Experiments
MA 547 Design and Analysis of Observational and Sampling Studies
MA 549 Analysis of Lifetime Data
MA 550 Time Series Analysis
MA 552 Distribution-Free and Robust Statistical Methods
MA 554 Applied Multivariate Analysis
MA 556 Applied Bayesian Statistics

Relevant Data Science Graduate Courses:
DS 501 Introduction to Data Science
DS 502 / MA 543 Statistical Methods for Data Science
DS 503 / CS 585 Big Data Management
DS 504 / CS 586 Big Data Analytics
DS 517 / MA 517 Mathematical Foundations for Data Science
DS / CS 541 Deep Learning
DS / CS 547 Information Retrieval
DS 551 Reinforcement Learning

Relevant Graduate Courses fulfilling the ethics requirement:
ID 500 Responsible Conduct of Research
BB 551 Research Integrity in the Sciences
SS 560: Artificial Intelligence: Exploring Technology, Ethics and Policy
CS 555 / DS 555: Responsible Artificial Intelligence

Rationale:
Over the years, the complete description of the M.S. and B.S. / M.S. degrees that originally appeared in the graduate catalog has been pared down, so that only the first two sections on general requirements shown in the motion remain. We propose to add back the original description to the catalog as shown, revised as shown in red to update our thesis / internship requirement, modify the ethics requirement to include options that were not available at the last writing of these requirements, change the total credits required for the degree, and keep up with additions and deletions of courses in the WPI curriculum. These changes will make the program's requirements more visible to students and faculty and will make the program and its catalog entry more consistent with other WPI MS programs.

Currently, to obtain the M.S. degree in Bioinformatics and Computational Biology (BCB), students may choose either a 6-9 credit internship requirement, or a 9 credit M.S. thesis requirement. We propose to clarify and update these requirements.

In our original program requirements when the program was initiated, we did not specify exactly how students should register for the thesis, or what the requirements were, beyond being a 9-credit project advised by BCB faculty. Our informal guidelines for students currently state the requirements written above regarding thesis advisor(s) and choosing a reader, as well as submission of a thesis document and presentation of a seminar to the faculty. We propose to make these requirements official as well as more visible by including them in the catalog.

We also propose to change the internship requirement from 6-9 credits to 3 credits. In the years since the program was designed, WPI has instituted a rule that internships should not be counted as more than 3 credits. Thus, our current requirement for a 6-9 credit internship is not in compliance with university rules. In addition, BCB faculty have found through experience that most students who choose the internship option obtain relatively short summer internships, which typically correspond approximately to a 3-credit

graduate course in terms of intellectual content gains. They certainly do not represent the amount of work involved in completing a 9 credit M.S. thesis. Thus, this change will also make the two options more equitable. Students who choose the internship will take 6 additional credits of program electives to complete the 30 credit requirement for the degree.

Lowering the total number of credits required for the MS degree from 33 to 30 credits will make our program in line with most other MS programs at WPI. In particular, the MS in Data Science, Computer Science, Biology & Biotechnology, and Biotechnology are all 30 credit programs. A number of other universities now offer a MS in Bioinformatics structured so that students can complete the degree in 1.5 years (3 semesters), typically in conjunction with an internship (e.g. University of Michigan, Boston University, Georgia Institute of Technology, and Brandeis). Reducing the required credits for our program to 30 would make a similar structure more feasible for our MS students, who could complete the program in 3 9-credit semesters plus a 3-credit summer internship, or use the summer to start or complete a research thesis. In addition, a 30 credit option would allow BS/MS students to complete their MS more readily in one extra year. Since students can double-count 40% of the courses for the degree (12 credits), they could complete the MS with two 9-credit semesters in their 5th year. This change will thus make our program competitive with similar programs across the country, and more attractive to our BS students. The credit reduction will not result in any major structural change in the degree since the reduction only affects the elective course requirement.

Finally, we propose to update our list of acceptable courses to offer students additional choices of courses, some of which are new since the Program was created, as well as deleting courses that are no longer offered. In particular, there are many more courses offered at the graduate level that are now appropriate to fulfill the ethics requirement, which we have modified accordingly. We expect that many students will choose ID 500 Responsible Conduct of Research, which was developed to be responsive to NIH requirements, but we also allow BB 551 as previously, along with two new courses related to ethics specifically with respect to AI (SS 560 and CS/DS 555). Given the excellent alternatives now available, we will no longer allow CS 3043 to count for 1 graduate credit to fulfill this requirement.

Impact on Program Requirements: Students choosing the internship option will register for a 3 credit rather than a 6-9 credit internship. They will choose additional courses (or research credits / ISGs with the approval of the BCB Graduate Committee) to complete the required 30 credits for the degree. Lowering the total credits required for the degree will bring the BCB MS Program into line with other WPI MS degree programs and make our program more competitive with other programs across the country. Updating the course list will increase choices for students and will not unduly burden any department.

Resources Needed: No new resources are required.

Implementation date: Academic year 2024-2025

Contacts: Prof. Liz Ryder (BBT), Prof. Sam Walcott (MA)

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify credit distribution requirements for Ph.D. in Mathematical Sciences

Motion: On behalf of the Department of Mathematical Sciences, the Committee on Graduate Studies and Research recommends, and I move that the credit distribution requirements for Ph.D. in Mathematical Sciences be modifed as described below.

Descriptions of the Proposed Modifications:
(Changes to be made to pp. 268-270 in the 23-24 WPI Graduate Catalog, with text highlighted in yellow to be added and text ~~struckthrough~~ to be deleted.

Ph.D. in Mathematical Sciences

Degree Type
Ph.D.

The goal of this program is to produce active and creative problem solvers, capable of contributing in academic and industrial environments. One distinguishing feature of this program is an optional Ph.D. project to be completed under the guidance of an external sponsor, e.g. industry or a national research center. The intention of this project is to connect theoretical knowledge with relevant applications and to improve skills in applying and communicating mathematics.

Admission Requirements:
Applicants are recommended to take the GRE Mathematics Subject Test.

Degree Requirements:
The course of study leading to the doctor of philosophy in mathematical sciences requires the completion of at least 90 credit hours beyond the bachelor's degree or at least 60 credit hours beyond the master's degree, as follows:

General Courses (credited for students with master's degrees)	30 credits
Research Preparation Phase	**24-30 credits**
Research-Related Courses, ~~or~~ Independent Studies, or Ph.D. Project	18-24
~~Ph.D. Project~~	~~1- 9 credits~~
Extra-Departmental Studies	6 credits

A brief description of other Ph.D. program requirements follows below. For further details, students are advised to consult the PhD Booklet that specifies Program Requirements. Program Requirements and Administrative Rules for the Department of Mathematical Sciences are available on the Resources Page on the Departmental website and/or can be obtained from departmental administrative assistants.

No later than two weeks before the end of the ~~Within a full-time student's~~ first semester of study (two weeks before the end of the second semester for part-time students), a student is required to submit a formal Plan of Study leading to the Ph.D. degree ~~must be submitted~~ to the ~~departmental~~ Graduate Program Committee for review and approval. The Plan of Study may subsequently be modified with review by the ~~departmental~~ Graduate Program Committee. International students may be subject to additional documentation of their full-time status as part of their visa requirements. Please consult WPI's International Student Handbook for up-to-date guidance.

Extra-Departmental Studies Requirement

A student must complete at least six semester hours of courses, at the 500 level or higher, in WPI departments other than ~~the~~ Mathematical Sciences ~~Department~~. Cross-listed courses can be counted toward meeting the extra departmental studies requirement. The student's advisor must approve the choice of cross-listed courses.

General Comprehensive Examination

A student must pass the general comprehensive examination (GCE) ~~in order~~ to become a Ph.D. candidate. The purpose of the GCE is to determine whether a student possesses the fundamental knowledge and skills necessary for study and research at the Ph.D. level. It consists of two three-hour exams. One exam is on real analysis, based on MA 503, and the other is on linear algebra, based on MA 502. ~~It is a written examination~~ The GCE is offered three times a year, ~~once each~~ in January, May, and August. ~~A s~~Students must pass both exams by the end of January of their second year if they enter in the fall, ~~and~~ or by the end of May of their second year if they enter in the spring.

Mathematical Sciences Ph.D. Project

PhD students have the option of earning up to nine Research Preparation credits by completing an external project. ~~A student may complete a Ph.D. project involving a problem originating with a sponsor external to the department.~~ The purposes of the external project are to broaden perspectives on the relevance and applications of mathematics and to improve skills in communicating mathematics and formulating and solving mathematical problems. Students participating in an external project are ~~encouraged~~ required to work with ~~industrial~~ a sponsor~~s~~ external to the department and are encouraged to find sponsors affiliated with academia, business, industry, or government. ~~Students are encouraged to work with industrial sponsors on problems involving applications of the mathematical sciences. Each Ph.D. project requires prior approval by the project advisor, the external sponsor, and the departmental Graduate Program Committee.~~ The policies governing the project are as follows:

- Limited to a maximum of 9 credit hours.
- Must be conducted under the supervision of a project advisor who is a member of the Mathematical Sciences faculty.
- A project proposal that outlines the nature, scope, and expected outcomes of the project must be approved prior to the start of the project by the project advisor, the external sponsor, and the Graduate Program Committee.
- The project will culminate with a report and oral presentation.

Ph.D. Preliminary Examination

~~Successful completion of the preliminary examination is required before a student can register for dissertation research credits.~~ The purpose of the preliminary examination is to determine whether a student's understanding of advanced areas of mathematics is adequate to conduct independent research and successfully complete a dissertation. The examination is given in two parts, a written part followed by an oral part, and covers subject matter in three areas determined by the student's preliminary examination committee. The preliminary examination is intended to test a student's overall breadth in advanced mathematical topics as well as knowledge of their area of specialization, and the three areas should be chosen accordingly. ~~The preliminary examination consists of both written and oral parts.~~

A full-time student must make the first attempt by the end of his or her third year (sixth year for part-time students) in the Ph.D. program. At least two months before the proposed date for the written exam, the student must request the examination with the Mathematical Sciences department by submitting syllabi covering all three topics for the examination. All three syllabi must be sent at the same time. The student must work with different faculty member(s) for each of the three topics. A student who passes the examination is considered a dissertator and is allowed to register for dissertation credits.

Ph.D. Dissertation
The Ph.D. dissertation is a significant work of original research conducted under the supervision of a dissertation advisor, who is normally a member of the departmental faculty. The dissertation advisor chairs the student's dissertation committee, which consists of at least five members that must be approved by the departmental Graduate Program Committee, including at least one recognized expert external to the department~~, and which must be approved by the departmental Graduate Program Committee~~. At least four~~six~~ months prior to completion of the dissertation, a student must submit a written dissertation proposal and present a public seminar on the research plan described in the proposal. The proposal must be approved by the dissertation committee. Upon completion of the dissertation and other program requirements, the student presents the dissertation to the dissertation committee and to the general community in a public oral defense. A student's dissertation committee, with the dissertation advisor acting as chairperson, determines by majority vote whether a dissertation is acceptable.

Unsatisfactory Progress
If the aforementioned milestones are not met, then the student must petition the graduate program committee to request extra time to meet the requirements or the student will be no longer be part of the Ph.D. program as of the following semester. The dissertation committee determines whether the dissertation is acceptable.

Rationale:
The graduate catalog text for the Ph.D. in Mathematical Sciences contains portions of text that are either out-of-date, vague, inconsistent with other documentation, or contain minor errors. The graduate program committee, with extensive departmental feedback, has reworded these entries to encompass significant changes aimed at rectifying these issues. The only major credit change was with regards to the Ph.D. project that was previously 1 to 9 credits and is now 0 to 9 credits.

Implementation Date: 2024-2025 Academic Year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to remove the Professional Master of Science in Financial Mathematics Program and associated BS/MS program

Motion: On behalf of the Department of Mathematical Sciences, the Committee on Graduate Studies and Research recommends and I move that the Professional Master of Science in Financial Mathematics Program and associated BS/MS program be removed.

Description of the Motion – modifications to the WPI Graduate Catalog:

Current Catalog Description on p. 263 in 23-24 Graduate Catalog related to BS/MS Program:

B.S./M.S. in Mathematical Sciences

Degree Type

B.S./M.S.

This program allows a student to work concurrently toward bachelor and master of science degrees in applied mathematics, applied statistics, financial mathematics and industrial mathematics.

Proposed Catalog Description related to BS/MS Program (with ~~strikethrough~~ and yellow for deletions)

B.S./M.S. in Mathematical Sciences

Degree Type

B.S./M.S. This program allows a student to work concurrently toward bachelor and master of science degrees in applied mathematics, applied statistics, ~~financial mathematics~~ and industrial mathematics.

Current Catalog Description

ALL TO BE REMOVED on p. 266-267 in 23-24 Graduate Catalog on Professional Master of Science in Financial Mathematics Program

Professional Master of Science in Financial Mathematics Program

Degree Type

Master of Science

This program offers an efficient, practice-oriented track to prepare students for quantitative careers in the financial industry, including banks, insurance companies, and investment and securities firms. The program gives students a solid background and sufficient breadth in the mathematical and statistical foundations needed to understand the cutting edge techniques of today and to keep up with future developments in this rapidly evolving area over the span of their careers. It also equips students with expertise in quantitative financial modeling and the computational methods and skills that are used to implement the models. The mathematical knowledge is complemented by studies in financial management, information technology and/or computer science.

The bridge from the academic environment to the professional workplace is provided by a professional master's project that involves the solution of a concrete, real-world problem directly originating in the financial industry. Students are encouraged to complete summer internships at financial firms. The department may help students to find suitable financial internships through the industrial connections of faculty affiliated with the Center for Industrial Mathematics and Statistics. Graduates of the program are expected to start or advance their professional careers in such areas as financial product development and pricing, risk management, investment decision support and portfolio management.

Degree Requirements

The master's program in Financial Mathematics requires a minimum of 30 credit-hours of coursework. Additional credit from coursework may be required by the department depending on the student's background. The curriculum consists of the following components:

1. 6 credits from required foundation courses:

Item #	Title	Credits
	MA 529 or MA 503	
	MA 528 or MA 540	

2. 12 credits from core financial mathematics courses:

Item #	Title	Credits
MA 571	Financial Mathematics I	3
MA 572	Financial Mathematics II	3
MA 573	Computational Methods of Financial Mathematics	3
MA 574	Portfolio Valuation and Risk Management	3
MA 575	Market and Credit Risk Models and Management	3

3. 3 credits chosen from Mathematical Sciences graduate courses MA 502-590.

B.S./M.S. students can count undergraduate courses MA 4213 Risk Theory, MA 4214 Survival Models, MA 4235 Mathematical Optimization, MA 4237 Probabilistic Methods in Operations Research, MA 4451 Boundary Value Problems, MA 4473 Partial Differential Equations, MA 4632 Probability and Mathematical Statistics II towards electives.

6 credit block in one of the following complementary areas outside of the Mathematical Sciences Department: Financial Management, Information Technology, or Computer Science.

Students with a degree or substantial work experience in one of the above complementary areas can substitute them with other courses subject to prior approval by the graduate committee

B.S./M.S. students can count suitable undergraduate courses towards the complementary area requirement according the number of credits of the corresponding graduate courses

2 of the complementary area credits can be earned by taking MA 579 Financial Programming Workshop

Capstone Project, which may be satisfied by one of the following options:

1. A three to six credit master's project.
2. A three credit master's practicum.
3. A three credit capstone course in financial mathematics.

The master's project consists of a creative application of mathematics to a real-world problem originating in the financial industry. It focuses on problem definition and solution using mathematical tools. The master's practicum requires a student to demonstrate the integration of advanced mathematical concepts and methods into professional practice. This could be done through an approved summer internship in industry or an applied research laboratory. The capstone course in financial mathematics can be chosen from MA 572, MA 573, MA 574, or MA 575 and will be an enhanced version of the course with extra work assigned. Prior to the start of the capstone course, a student seeking to use the course to satisfy the requirement must declare this intention to the professor of the course.

6. MA 562A and MA 562B Professional Master's Seminar (for no credit)

MA 529 or MA 503

Item #	Title	Credits
MA 529	Stochastic Processes	3
MA 503	Lebesgue Measure and Integration	3

MA 528 or MA 540

Item #	Title	Credits
MA 528	Measure Theoretic Probability Theory	3
MA 540/4631	Probability and Mathematical Statistics I	3

Rationale:

The enrollment in this program has been decreasing over past years and we did not accept any new applicants the past two admission cycles. We will be keeping the associated Financial Mathematics courses

as they will now be electives for the MS in Fin Tech, and are potential electives for other programs in Mathematical Sciences, as well as for the Data Science and Artificial Intelligence MS programs. In addition, we have redesigned our Industrial Mathematics MS curriculum to allow for the potential focus in Financial Mathematics.

Implementation: 2024-2025 Academic Year.

Date: May 7, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to establish a Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI

Motion: On behalf of the Collaborative Accelerated Master's Programs (CAMPs) Framework between Framingham State University and WPI Working Group, the Committee on Graduate Studies and Research recommends, and I move, that the Collaborative Accelerated Master's Framework between Framingham State University and WPI be established, as described below.

Description of the Motion:
Summary:
This motion consists of two parts:

- **Part I: Collaborative Accelerated Master's Programs (CAMPs) Framework between Framingham State University and WPI**
  Part I establishes a Collaborative Accelerated Master's Programs (CAMPs) Framework between Framingham State University and WPI, in which undergraduate students at Framingham State University, after graduating with their bachelor's degree, may pursue a master's degree at WPI in an accelerated manner.

- **Part II: Collaborative Accelerated Master's Programs between Framingham State University and WPI**
  Any department or program at WPI that confers a master's degree may opt-in to participate in this Collaborative Framework. Part II provides a template for the creation of a Master's-specific (e.g., M.S. degree in Neuroscience) Program within this Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI, in which additional information and rules specified by the opting-in, accelerated master's program (e.g., M.S. in Neuroscience) at WPI are provided.

Part I: Collaborative Accelerated Master's Programs (CAMPs) Framework between Framingham State University and WPI
Proposed Catalog Description: *To be included in a new section of the WPI Graduate Catalog that describes CAMPs that WPI has established with partner institutions:*

> **Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI.**
> The Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI allows undergraduate students from Framingham State University to apply to and, after graduating with their bachelor's degree from Framingham State University, pursue a master's degree at WPI in an accelerated manner. This may include B.A., B.S., and other bachelor's degrees at Framingham State University, and any opting-in master's degree programs at WPI (including but not limited to M.S. degrees).
>
> Students in this Collaborative Accelerated Master's Programs Framework must satisfy all the requirements of their respective bachelor's degree at Framingham State University and all the requirements of their master's degree at WPI. WPI allows these students to count toward their master's degree up-to two of their advanced senior-level undergraduate courses, from a list of eligible Framingham State University courses that satisfy specific criteria.

General information about student eligibility, application process, and credit double-counting rules is available at https://www.wpi.edu/academics/graduate/camps. This webpage also contains the list of collaborative accelerated master's degrees that are available to Framingham State University students, together with specific program-specific eligibility and degree requirements.

Summary Description: This part establishes a Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI, in which undergraduate students at Framingham State University can apply to and, after graduating with their bachelor's degree from Framingham State University, pursue a master's degree at WPI in an accelerated manner.

This motion specifies general rules for this cross-institution collaboration. This collaboration may include B.A., B.S., and other bachelor's degrees at Framingham State University and any opting-in master's degree programs at WPI (including but not limited to M.S. degrees).

Part II describes a template for WPI master's programs (e.g., M.S in Computer Science) to opt-in to participate in this Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI. The template for a collaborative accelerated master's program provides structure for additional requirements from the specific WPI master's degree program for students to be admitted to and fulfill said master's degree requirements at WPI.

Template: Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI

1. Framework Description

This Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI allows undergraduate students from Framingham State University to apply to and, after graduating with their bachelor's degree from Framingham State University, pursue a master's degree at WPI in an accelerated manner. This may include B.A., B.S., and other bachelor's degrees at Framingham State University, and any opting-in master's degree programs at WPI (including but not limited to M.S. degrees).

Students in this Collaborative Accelerated Master's Programs Framework must satisfy all the requirements of their respective bachelor's degree at Framingham State University and all the requirements of their master's degree at WPI. WPI allows these students to count toward their master's degree up-to two of their advanced senior-level undergraduate courses, from a list of eligible Framingham State University courses that satisfy the rules specified in the following sections.

The administration of this Collaborative Accelerated Master's Programs Framework will be led by two *Collaborative Framework Coordinators*, one at Framingham State University and one at WPI, who will oversee the implementation and administration of this Collaborative Accelerated Master's Programs Framework.

2. Participating Master's Degree Programs at WPI

Any master's degree program at WPI may opt-in to participate in this Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI. For simplicity, this specific master's degree program will be denoted by "Y" from now on.

To opt-in, a WPI master's program Y shall, in consultation with the *Collaborative Framework Coordinators* at Framingham State University and at WPI, prepare a motion for consideration and approval by the WPI Committee on Graduate Studies and Research (CGSR) and subsequently by the WPI Faculty. Said motion must comply with the general rules in the Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI; must provide any additional requirements from the

specific WPI master's degree program for students to be admitted to and fulfill the master's degree in Y at WPI; and must identify a *WPI Y-Program Coordinator,* a faculty or staff member who will serve as the point-of-contact for the master's degree program in Y as it relates to this Collaborative Accelerated Master's Programs Framework. This motion shall come endorsed by the faculty in the department or program that offers the master's degree at WPI. A template for a master's program to opt-in is provided in Part II.

3. Student Admissions Requirements and Application Process

Eligibility:

Students from Framingham State University in majors relevant to the WPI master's degree program in Y or who otherwise have the necessary coursework are eligible to apply to the Collaborative Accelerated Master's Program in Y. A minimum overall GPA of 3.0 is required; however, students with a GPA lower than 3.0 may petition to the *Collaborative Framework Coordinators* at Framingham State University and at WPI for special eligibility consideration. Interested students should seek academic advice from the *Collaborative Framework Coordinators* at Framingham State University and at WPI, their academic advisor at Framingham State University, and the *WPI Y-Program Coordinator*, no later than during their junior year so that they have sufficient time to plan their course selection. Additional information specific to the Y-Program and possibly additional eligibility criteria are provided in the specific Y-Program description (see Part II).

Admissions Process and Deadlines:

The application, application review and admissions processes into a participating Y-Program within this Collaborative Accelerated Master's Programs Framework are the same as those of the internal B.S./M.S. programs at WPI, which are described in what follows. The application consists of a statement of purpose, academic transcript(s) and two letters of recommendation. GRE, applicable ESL test, and application fees are waived. Applications must be submitted through the WPI Graduate Admissions Office's application system. Application review and admission decisions are handled by the participating WPI master's program in Y that the student wishes to pursue. Applications are received and reviewed on a rolling basis.

Eligible students are expected to apply officially for admission to a Y-Program within this Collaborative Accelerated Master's Programs Framework during their junior year at Framingham State University. This allows students to best plan their senior year courses. However, applications will be accepted during the students' senior year or up to three years after graduating with their bachelor's degree from Framingham State University. In addition, students accepted into a Y-Program are allowed to defer the beginning of their master's studies at WPI for up to one year after graduating with their bachelor's degree from Framingham State University. In any case, students are expected to start their master's degree in Y at WPI no later than three academic years after graduating with their bachelor's degree from Framingham State University.

Becoming a Graduate Student at WPI:

Students accepted into a Y-Program within this Collaborative Accelerated Master's Programs Framework will become graduate students at WPI only after they have completed their undergraduate degree at Framingham State University and register for graduate courses at WPI.

4. Course Registration at WPI

Full-time, matriculated, undergraduate students at Framingham State University who have been admitted to a CAMP pathway are eligible to cross-register up to two approved WPI graduate courses prior to the completion of their undergraduate studies, with one cross-registration of a WPI graduate course permitted per semester. WPI graduate courses designated for cross-registration require no additional tuition for undergraduate students at Framingham State University admitted to a CAMP pathway.

Undergraduate students from Framingham State University admitted to a CAMP pathway who are planning to register for a WPI graduate course should consult with their undergraduate academic advisors and with the appropriate WPI Pathway Coordinator to ensure they possess the necessary course prerequisites and/or recommended background before registering for a WPI graduate course. WPI and Framingham State University will develop a process to facilitate cross-registration while the student admitted to the CAMP pathway program is still an undergraduate at Framingham State University.

5. Requirements for the Collaborative Accelerated Master's Programs Framework

- Students enrolled in a Collaborative Accelerated Master's Program in Y as part of this Collaborative Framework must satisfy all the program requirements of their bachelor's degree at Framingham State University and all the program requirements of their master's degree in Y at WPI.

- Detailed rules about course counting are provided in the next section.

- In consultation with the student's major academic advisor at Framingham State University, the *WPI Y-Program Coordinator* of the specific master's program being pursued by the student, the *Collaborative Framework Coordinators* at Framingham State University and at WPI, and both Institutions' catalogs, the student will fill out their "*Plan of Study Form for the Collaborative Accelerated Master's Program in Y*" outlining the selections made to satisfy the master's degree requirements, including the courses that will be double-counted. This Plan of Study must comply with all the regulations of the Collaborative Accelerated Master's Programs Framework described here. This Plan of Study must be approved by the *WPI Y-Program Coordinator*.

6. Course-Counting Rules at WPI

- Students enrolled in a Y-Program of this Collaborative Accelerated Master's Programs Framework will be allowed to count toward their master's degree in Y at WPI up-to two advanced, senior level courses from Framingham State University that satisfy all of the following conditions:

    - The course is included on the list of eligible courses from Framingham State University provided in the *Plan of Study Form for the Collaborative Accelerated Master's Program in Y;* this form also provides the equivalent number of graduate credits carried by each eligible course.
    - The student receives a grade of "B-" or higher on the course.
    - The student takes the course while still being an undergraduate at Framingham State University.

- If applicable, eligible 4000-level or graduate level courses taken at WPI while the student is still an undergraduate at Framingham State University may also count toward the student's master's degree in Y. Eligible 4000-level WPI courses are listed on the internal BS/MS program in Y entry of the WPI Graduate Catalog, and eligible WPI graduate courses are listed on the master's degree in Y entry of the WPI Graduate Catalog. These eligible courses also appear on the *"Plan of Study Form for the Collaborative Accelerated Master's Program in Y"*.

- Courses not on the aforementioned lists of eligible courses may also count if approved by the *WPI Y-Program Coordinator*, the *Collaborative Framework Coordinator* at WPI, and, if applicable, the *Collaborative Framework Coordinator* at Framingham State University.

- All other existing WPI credit transfer and double-counting rules apply to students in this collaborative framework. No more than 40% of the credit hours required for the master's degree in Y may come from the total aggregate of graduate-equivalent credit hours from the two Framingham State University eligible courses, and when applicable from undergraduate and/or graduate WPI

courses, taken while the student was still an undergraduate at Framingham State University. A typical master's degree at WPI requires 30-33 graduate credits, so up to 12 graduate credits or equivalent undergraduate credits that meet the requirements for the master's degree in Y can be counted. Some master's degree programs at WPI may have a more restrictive limit (e.g., 30%); in that case the limit is specified in the *"Plan of Study Form for the Collaborative Accelerated Master's Program in Y."*

- Unless otherwise noted, Framingham State University undergraduate courses carry 3 undergraduate credits at WPI and are subject to the same internal credit conversion rule used at WPI, namely 3 undergraduate credits are equivalent to 2 graduate credits.

7. Program Administration

This Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI will be jointly administered by a *Collaborative Framework Coordinator* at Framingham State University and a *Collaborative Framework Coordinator* at WPI who will oversee all administrative aspects of this Collaborative Accelerated Master's Programs Framework. They will coordinate academic advising aspects of the specific bachelor's and master's degrees being pursued by a student in a Y-Program with the student's undergraduate academic advisor and the *WPI Y-Program Coordinator*.

Part II: Collaborative Accelerated Master's Programs between Framingham State University and WPI

Summary Description: Any WPI department or program that confers a master's degree may opt-in to participate in the Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI. To opt-in, the department or program shall, in consultation with the *Collaborative Framework Coordinators* at Framingham State University and at WPI, prepare a motion for consideration and approval by the WPI Committee on Graduate Studies and Research (CGSR) and subsequently by the WPI Faculty, which must comply with the general rules in this Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI, and must provide the information listed in the template below.

Template: Collaborative Accelerated Master's Program in Y between Framingham State University and WPI

This document must include:

1. Additional eligibility criteria, if any, for students from Framingham State University to apply to the Collaborative Accelerated Master's Program in Y. Typically, the disciplines of the bachelor's degree and of the master's degree are thematically related but are not required to be so.

2. Recommended background, prerequisites, and/or additional guidelines for students who wish to pursue the Y-Program.

3. A "*Plan of Study Form for the Collaborative Accelerated Master's Program in Y between Framingham State University and WPI*", listing:
    a. The degree requirements that a student in this Y-Program needs to satisfy to graduate with a master's degree in Y from WPI.
    b. The list of advanced, senior-level courses from Framingham State University that may count toward the master's degree in Y at WPI, the number of equivalent graduate credits carried by each of these courses, and the specific master's degree requirement(s) that each of these courses may satisfy. Note that the maximum number of undergraduate courses from Framingham State University that may be counted toward the master's degree at WPI is two, as per the New England Commission of Higher Education (NECHE) rules.

c. If applicable, the list of WPI 4000-level courses that a student in the Y-Program may take to fulfill master's degree requirements, whether there is a minimum grade requirement, and whether these courses count toward the master's degree only when they are taken while the student is still an undergraduate at Framingham State University.
d. The list of WPI graduate courses that a student in the Y-Program may take to fulfill master's degree requirements.
e. The list of pairs of courses at Framingham State University and at WPI with significant overlap, if any, such that credit toward the master's degree at WPI will be awarded for at most one of the two courses.
f. If lower than the typical WPI 40% upper limit, the maximum total percentage of the graduate credit hours required for the master's degree in Y that the Y-Program allows students to double-count between their undergraduate and graduate degrees. This upper limit applies to the total aggregate of graduate-equivalent credit hours from the two Framingham State University eligible courses, and when applicable from undergraduate and/or graduate WPI courses, taken while the student was still an undergraduate at Framingham State University.

4. The name of a WPI faculty or staff member, hereby called *"WPI Y-Program Coordinator"* who will serve as the point of contact for the master's program in Y within this Collaborative Framework with Framingham State University. This master's-specific coordinator will work in collaboration with the WPI *Collaborative Framework Coordinator* on the academic aspects of the Collaborative Accelerated Master's Program in Y, and on providing academic advising to students in this Y-Program.

5. Endorsement from the faculty in the department or program that offers the master's degree in Y.

It is the responsibility of the *Collaborative Framework Coordinators* at WPI and at Framingham State University, in communication with the *WPI Y-Program Coordinator*, to keep all the information about the Collaborative Accelerated Master's Program in Y up-to-date, and to inform the counterparts at Framingham State University or at WPI promptly when a change occurs (e.g., a change in a course description or a change in degree requirements).

Rationale:

Benefits to Framingham State University and to WPI of this Collaborative Accelerated Master's Programs Framework:

This Collaborative Accelerated Master's Programs Framework strengthens collaborations between Framingham State University and WPI, and is beneficial for students, WPI, and Framingham State University.

This Collaborative Accelerated Master's Programs Framework helps highlight graduate options for Framingham State University undergraduate students. Students from Framingham State University can benefit from this Collaborative Accelerated Master's Programs Framework as it allows them to pursue their master's degrees at WPI in an accelerated manner. A master's degree will poise these students well for future employment and/or for entry into Ph.D. programs. Having a local option for a graduate degree can be attractive to students.

This Collaborative Accelerated Master's Programs Framework benefits Framingham State University by allowing it to attract and nurture students who are interested in pursuing their bachelor's and master's programs in a synergistic manner, and in disciplines that may not be available at Framingham State University at the graduate level.

This Collaborative Accelerated Master's Programs Framework benefits WPI by attracting external students with strong undergraduate training (and who are familiar with local area) to pursue their master's degree at WPI.

WPI has a long tradition of offering the B.S./M.S. option to its students, either in the same department/program or in different departments/programs. This Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI is inspired by WPI's internal B.S./M.S. option and will create a new type of collaboration between these two institutions and a pathway for students to obtain a bachelor's and a master's degrees in an accelerated and synergistic manner.

Design choices of the Collaborative Accelerated Master's Programs Framework:

The Collaborative Accelerated Master's Programs Framework described here follows all the internal WPI B.S./M.S. rules; it has been informed by the B.S./M.S. program descriptions in the WPI Graduate Catalog.

There are numerous examples of B.S./M.S. students at WPI who have completed their B.S degree in a department or program (e.g., Physics) and their M.S. degree in a different department or program (e.g., Computer Science). WPI departments and programs that offer the B.S./M.S. option do regulate the M.S. portion of the degree (e.g., what undergraduate courses can be double-counted toward the M.S. degree). Same applies to this Collaborative Accelerated Master's Programs Framework. With a few exceptions (e.g., the B.S./M.S. options in Fire Protection Engineering and in Systems Engineering, which are mainly available to engineering undergraduate majors only), departments/programs' B.S./M.S. options at WPI are available to any WPI undergraduate major (see for example the B.S./M.S. option in Data Science in the Graduate Catalog). In that spirit, the proposed Collaborative Accelerated Master's Programs Framework allows students to pursue a master's degree at WPI in a discipline related to, but not necessarily the same as, the discipline of their undergraduate major at Framingham State University.

The rules described here for students to register for courses at WPI while they are still undergraduate students at Framingham State University include the following:

- Undergraduate students are officially admitted to a CAMP pathway upon admission to the corresponding WPI MS program associated with that particular CAMP.
- Individuals admitted to a CAMP pathway officially become WPI MS students upon successful completion of their undergraduate degree at Framingham State University.
- Undergraduate students admitted to a CAMP pathway must complete a WPI BS/MS course designation form and submit to their academic advisor and appropriate WPI Pathway Coordinator (this information is communicated to the Registrars at both institutions).
- A maximum of two undergraduate courses from Framingham State University can be cross registered with WPI for a CAMP pathway. These undergraduate courses can only be selected from a list of approved courses specified by the faculty to support a specific CAMP pathway. These undergraduate courses can be completed prior to admission to a CAMP pathway.
- A maximum of two WPI graduate courses can be cross registered with Framingham State University for a CAMP pathway.
- WPI graduate courses can only be taken once a full-time matriculated undergraduate student from Framingham State University has been admitted to a CAMP pathway. Only one WPI graduate course can be taken per semester (Fall or Spring).
- A maximum of 10 undergraduate students from Framingham State University can be admitted to a specific CAMP pathway per year during a five-year time period with the option to update this limit at the end of the third year.

This agreement was approved by the WPI Provost in consultation with the WPI Registrar.

The limit of at most two undergraduate courses from Framingham State University to count for the master's degree at WPI has been adopted to satisfy requirements from the New England Commission of Higher Education (NECHE), as per conversations with NECHE's Senior Vice-President in the spring of 2023.

No special considerations are needed for this Collaborative Accelerated Master's Programs Framework regarding ABET accreditation as engineering master's degrees at WPI are not constrained by ABET accreditation rules.

Allowing students to take three "gap" years between completing their bachelor's degree at Framingham State University and starting their master's degree at WPI is consistent with WPI's own internal B.S./M.S. rules (which allow a 5-year gap). It accommodates potential changes of circumstances in students' lives and incentivizes students to come back for a graduate degree after spending time in industry or other endeavors, making the program more flexible and attractive.

Implementation Date: Implementation date for this action is AY2024-2025.

Contacts for this Collaborative Accelerated Master's Programs Framework between Framingham State University and WPI:

Contacts at WPI:
Collaborative Accelerated Master's Programs Framework Coordinator at WPI:

- Alexander Wyglinski, Associate Dean of Graduate Studies and Professor of Electrical and Computer Engineering

Faculty, Staff, and Administrators who have provided input for this Collaborative Accelerated Master's Programs Framework:

- Carolina Ruiz, Professor of Computer Science and Associate Dean of Arts and Sciences
- Faculty from all Schools, and numerous Department and Programs
- Committee on Graduate Studies and Research (CGSR)
- Mark Richman, Secretary of the Faculty
- Art Heinricher, Provost
- Arne Gericke, Dean of Undergraduate Studies
- Terri Camesano, Dean of Graduate Studies
- Jean A. King, Dean of Arts and Sciences
- John McNeill, Dean of Engineering
- Debora Jackson, Dean of The Business School
- Mimi Sheller, Dean of The Global School
- Carolina Ruiz, Associate Dean of Arts & Sciences
- Sarah Miles, Registrar
- Melissa Terrio, Executive Director of Graduate Recruitment and Admissions
- Scott Butler, Executive Director of Program Delivery and Strategic Partnerships
- Amy Fabiano, Associate General Counsel
- Elke Rundensteiner, Professor of Computer Science and Data Science Program Director
- Jagan Srinivasan, Professor of Biology and Neuroscience M.S. Program Director
- Anita Mattson, Professor of Chemistry & Biochemistry and Department Head

Contacts at Framingham State University:
Collaborative Accelerated Master's Programs Framework Coordinator at Framingham State University:

- Aline Davis, Professor of Biology

Other Faculty, Staff, and Administrators at Framingham State University:

- Michael Krul, Associate Professor of Mathematics and Department Chair
- Ann McDonald, General Counsel, Chief of Staff, and Secretary to the Board of Trustees
- Lawrence W. McKenna III, Associate Professor of Earth & Environmental Science and Department Chair
- Amanda Simons, Professor of Biology and Department Chair
- Shelli Waetzig, Professor of Chemistry

Contacts at NECHE:

- The Senior Vice President of the New England Commission of Higher Education (NECHE), Patricia O'Brien, SNDdeN.

Date: 05/07/2024
To: WPI Faculty
From: Committee on Graduate Studies and Research
Re: Motion to establish a Collaborative Accelerated Master's Programs Framework between Utica University and WPI

Motion: On behalf of the Collaborative Accelerated Master's Programs (CAMPs) Framework between Utica University and WPI Working Group, the Committee on Graduate Studies and Research recommends, and I move, that the Collaborative Accelerated Master's Framework between Utica University and WPI be established, as described below.

Description of the Motion:
Summary:
This motion consists of two parts:

- **Part I: Collaborative Accelerated Master's Programs (CAMPs) Framework between Utica University and WPI**
  Part I establishes a Collaborative Accelerated Master's Programs (CAMPs) Framework between Utica University and WPI, in which undergraduate students at Utica University, after graduating with their bachelor's degree, may pursue a master's degree at WPI in an accelerated manner.

- **Part II: Collaborative Accelerated Master's Programs between Utica University and WPI**
  Any department or program at WPI that confers a master's degree may opt-in to participate in this Collaborative Framework. Part II provides a template for the creation of a Master's-specific (e.g., M.S. degree in Neuroscience) Program within this Collaborative Accelerated Master's Programs Framework between Utica University and WPI, in which additional information and rules specified by the opting-in, accelerated master's program (e.g., M.S. in Neuroscience) at WPI are provided.

Part I: Collaborative Accelerated Master's Programs (CAMPs) Framework between Utica University and WPI
Proposed Catalog Description: *To be included in a new section of the WPI Graduate Catalog that describes CAMPs that WPI has established with partner institutions:*

> **Collaborative Accelerated Master's Programs Framework between Utica University and WPI.**
> The Collaborative Accelerated Master's Programs Framework between Utica University and WPI allows undergraduate students from Utica University to apply to and, after graduating with their bachelor's degree from Utica University, pursue a master's degree at WPI in an accelerated manner. This may include B.A., B.S., and other bachelor's degrees at Utica University, and any opting-in master's degree programs at WPI (including but not limited to M.S. degrees).
>
> Students in this Collaborative Accelerated Master's Programs Framework must satisfy all the requirements of their respective bachelor's degree at Utica University and all the requirements of their master's degree at WPI. WPI allows these students to count toward their master's degree up-to two of their advanced senior-level undergraduate courses, from a list of eligible Utica University courses that satisfy specific criteria.
>
> General information about student eligibility, application process, and credit double-counting rules is available at https://www.wpi.edu/academics/graduate/camps. This webpage also contains the list of collaborative accelerated master's degrees that are available to Utica University students, together with specific program-specific eligibility and degree requirements.

Summary Description: This part establishes a Collaborative Accelerated Master's Programs Framework between Utica University and WPI, in which undergraduate students at Utica University can apply to and, after graduating with their bachelor's degree from Utica University, pursue a master's degree at WPI in an accelerated manner.

This motion specifies general rules for this cross-institution collaboration. This collaboration may include B.A., B.S., and other bachelor's degrees at Utica University and any opting-in master's degree programs at WPI (including but not limited to M.S. degrees).

Part II describes a template for WPI master's programs (e.g., M.S in Computer Science) to opt-in to participate in this Collaborative Accelerated Master's Programs Framework between Utica University and WPI. The template for a collaborative accelerated master's program provides structure for additional requirements from the specific WPI master's degree program for students to be admitted to and fulfill said master's degree requirements at WPI.

Template: Collaborative Accelerated Master's Programs Framework between Utica University and WPI

1. Framework Description

This Collaborative Accelerated Master's Programs Framework between Utica University and WPI allows undergraduate students from Utica University to apply to and, after graduating with their bachelor's degree from Utica University, pursue a master's degree at WPI in an accelerated manner. This may include B.A., B.S., and other bachelor's degrees at Utica University, and any opting-in master's degree programs at WPI (including but not limited to M.S. degrees).

Students in this Collaborative Accelerated Master's Programs Framework must satisfy all the requirements of their respective bachelor's degree at Utica University and all the requirements of their master's degree at WPI. WPI allows these students to count toward their master's degree up-to two of their advanced senior-level undergraduate courses, from a list of eligible Utica University courses that satisfy the rules specified in the following sections.

The administration of this Collaborative Accelerated Master's Programs Framework will be led by two *Collaborative Framework Coordinators*, one at Utica University and one at WPI, who will oversee the implementation and administration of this Collaborative Accelerated Master's Programs Framework.

2. Participating Master's Degree Programs at WPI

Any master's degree program at WPI may opt-in to participate in this Collaborative Accelerated Master's Programs Framework between Utica University and WPI. For simplicity, this specific master's degree program will be denoted by "Y" from now on.

To opt-in, a WPI master's program Y shall, in consultation with the *Collaborative Framework Coordinators* at Utica University and at WPI, prepare a motion for consideration and approval by the WPI Committee on Graduate Studies and Research (CGSR) and subsequently by the WPI Faculty. Said motion must comply with the general rules in the Collaborative Accelerated Master's Programs Framework between Utica University and WPI; must provide any additional requirements from the specific WPI master's degree program for students to be admitted to and fulfill the master's degree in Y at WPI; and must identify a *WPI Y-Program Coordinator,* a faculty or staff member who will serve as the point-of-contact for the master's degree program in Y as it relates to this Collaborative Accelerated Master's Programs Framework. This motion shall come endorsed by the faculty in the department or program that offers the master's degree at WPI. A template for a master's program to opt-in is provided in Part II.

3. Student Admissions Requirements and Application Process

Eligibility:
Students from Utica University in majors relevant to the WPI master's degree program in Y or who otherwise have the necessary coursework are eligible to apply to the Collaborative Accelerated Master's Program in Y. A minimum overall GPA of 3.0 is required; however, students with a GPA lower than 3.0 may petition to the *Collaborative Framework Coordinators* at Utica University and at WPI for special eligibility consideration. Interested students should seek academic advice from the *Collaborative Framework Coordinators* at Utica University and at WPI, their academic advisor at Utica University, and the *WPI Y-Program Coordinator*, no later than during their junior year so that they have sufficient time to plan their course selection. Additional information specific to the Y-Program and possibly additional eligibility criteria are provided in the specific Y-Program description (see Part II).

Admissions Process and Deadlines:
The application, application review and admissions processes into a participating Y-Program within this Collaborative Accelerated Master's Programs Framework are the same as those of the internal B.S./M.S. programs at WPI, which are described in what follows. The application consists of a statement of purpose, academic transcript(s) and two letters of recommendation. GRE, applicable ESL test, and application fees are waived. Applications must be submitted through the WPI Graduate Admissions Office's application system. Application review and admission decisions are handled by the participating WPI master's program in Y that the student wishes to pursue. Applications are received and reviewed on a rolling basis.
Eligible students are expected to apply officially for admission to a Y-Program within this Collaborative Accelerated Master's Programs Framework during their junior year at Utica University. This allows students to best plan their senior year courses. However, applications will be accepted during the students' senior year or up to three years after graduating with their bachelor's degree from Utica University. In addition, students accepted into a Y-Program are allowed to defer the beginning of their master's studies at WPI for up to one year after graduating with their bachelor's degree from Utica University. In any case, students are expected to start their master's degree in Y at WPI no later than three academic years after graduating with their bachelor's degree from Utica University.

Becoming a Graduate Student at WPI:
Students accepted into a Y-Program within this Collaborative Accelerated Master's Programs Framework will become graduate students at WPI only after they have completed their undergraduate degree at Utica University and register for graduate courses at WPI.

4. Course Registration at WPI

Full-time, matriculated, undergraduate students at Utica University who have been admitted to a CAMP pathway are eligible to cross-register up to two approved WPI graduate courses prior to the completion of their undergraduate studies, with one cross-registration of a WPI graduate course permitted per semester. WPI graduate courses designated for cross-registration require no additional tuition for undergraduate students at Utica University admitted to a CAMP pathway.

Undergraduate students from Utica University admitted to a CAMP pathway who are planning to register for a WPI graduate course should consult with their undergraduate academic advisors and with the appropriate WPI Pathway Coordinator to ensure they possess the necessary course prerequisites and/or recommended background before registering for a WPI graduate course. WPI and Utica University will develop a process to facilitate cross-registration while the student admitted to the CAMP pathway program is still an undergraduate at Utica University.

5. Requirements for the Collaborative Accelerated Master's Programs Framework

- Students enrolled in a Collaborative Accelerated Master's Program in Y as part of this Collaborative Framework must satisfy all the program requirements of their bachelor's degree at Utica University and all the program requirements of their master's degree in Y at WPI.

- Detailed rules about course counting are provided in the next section.

- In consultation with the student's major academic advisor at Utica University, the *WPI Y-Program Coordinator* of the specific master's program being pursued by the student, the *Collaborative Framework Coordinators* at Utica University and at WPI, and both Institutions' catalogs, the student will fill out their "*Plan of Study Form for the Collaborative Accelerated Master's Program in Y*" outlining the selections made to satisfy the master's degree requirements, including the courses that will be double-counted. This Plan of Study must comply with all the regulations of the Collaborative Accelerated Master's Programs Framework described here. This Plan of Study must be approved by the *WPI Y-Program Coordinator*.

6. Course-Counting Rules at WPI

- Students enrolled in a Y-Program of this Collaborative Accelerated Master's Programs Framework will be allowed to count toward their master's degree in Y at WPI up-to two advanced, senior level courses from Utica University that satisfy all of the following conditions:

    - The course is included on the list of eligible courses from Utica University provided in the *Plan of Study Form for the Collaborative Accelerated Master's Program in Y;* this form also provides the equivalent number of graduate credits carried by each eligible course.
    - The student receives a grade of "B-" or higher on the course.
    - The student takes the course while still being an undergraduate at Utica University.

- If applicable, eligible 4000-level or graduate level courses taken at WPI while the student is still an undergraduate at Utica University may also count toward the student's master's degree in Y. Eligible 4000-level WPI courses are listed on the internal BS/MS program in Y entry of the WPI Graduate Catalog, and eligible WPI graduate courses are listed on the master's degree in Y entry of the WPI Graduate Catalog. These eligible courses also appear on the *"Plan of Study Form for the Collaborative Accelerated Master's Program in Y"*.

- Courses not on the aforementioned lists of eligible courses may also count if approved by the *WPI Y-Program Coordinator*, the *Collaborative Framework Coordinator* at WPI, and, if applicable, the *Collaborative Framework Coordinator* at Utica University.

- All other existing WPI credit transfer and double-counting rules apply to students in this collaborative framework. No more than 40% of the credit hours required for the master's degree in Y may come from the total aggregate of graduate-equivalent credit hours from the two Utica University eligible courses, and when applicable from undergraduate and/or graduate WPI courses, taken while the student was still an undergraduate at Utica University. A typical master's degree at WPI requires 30-33 graduate credits, so up to 12 graduate credits or equivalent undergraduate credits that meet the requirements for the master's degree in Y can be counted. Some master's degree programs at WPI may have a more restrictive limit (e.g., 30%); in that case the limit is specified in the *"Plan of Study Form for the Collaborative Accelerated Master's Program in Y."*

- Unless otherwise noted, Utica University undergraduate courses carry 3 undergraduate credits at WPI and are subject to the same internal credit conversion rule used at WPI, namely 3 undergraduate credits are equivalent to 2 graduate credits.

7. Program Administration

This Collaborative Accelerated Master's Programs Framework between Utica University and WPI will be jointly administered by a *Collaborative Framework Coordinator* at Utica University and a *Collaborative Framework Coordinator* at WPI who will oversee all administrative aspects of this Collaborative Accelerated Master's Programs Framework. They will coordinate academic advising aspects of the specific bachelor's and master's degrees being pursued by a student in a Y-Program with the student's undergraduate academic advisor and the *WPI Y-Program Coordinator*.

Part II: Collaborative Accelerated Master's Programs between Utica University and WPI

Summary Description: Any WPI department or program that confers a master's degree may opt-in to participate in the Collaborative Accelerated Master's Programs Framework between Utica University and WPI. To opt-in, the department or program shall, in consultation with the *Collaborative Framework Coordinators* at Utica University and at WPI, prepare a motion for consideration and approval by the WPI Committee on Graduate Studies and Research (CGSR) and subsequently by the WPI Faculty, which must comply with the general rules in this Collaborative Accelerated Master's Programs Framework between Utica University and WPI, and must provide the information listed in the template below.

Template: Collaborative Accelerated Master's Program in Y between Utica University and WPI

This document must include:

1. Additional eligibility criteria, if any, for students from Utica University to apply to the Collaborative Accelerated Master's Program in Y. Typically, the disciplines of the bachelor's degree and of the master's degree are thematically related but are not required to be so.

2. Recommended background, prerequisites, and/or additional guidelines for students who wish to pursue the Y-Program.

3. A "*Plan of Study Form for the Collaborative Accelerated Master's Program in Y between Utica University and WPI*", listing:
    a. The degree requirements that a student in this Y-Program needs to satisfy to graduate with a master's degree in Y from WPI.
    b. The list of advanced, senior-level courses from Utica University that may count toward the master's degree in Y at WPI, the number of equivalent graduate credits carried by each of these courses, and the specific master's degree requirement(s) that each of these courses may satisfy. Note that the maximum number of undergraduate courses from Utica University that may be counted toward the master's degree at WPI is two, as per the New England Commission of Higher Education (NECHE) rules.
    c. If applicable, the list of WPI 4000-level courses that a student in the Y-Program may take to fulfill master's degree requirements, whether there is a minimum grade requirement, and whether these courses count toward the master's degree only when they are taken while the student is still an undergraduate at Utica University.
    d. The list of WPI graduate courses that a student in the Y-Program may take to fulfill master's degree requirements.
    e. The list of pairs of courses at Utica University and at WPI with significant overlap, if any, such that credit toward the master's degree at WPI will be awarded for at most one of the two courses.
    f. If lower than the typical WPI 40% upper limit, the maximum total percentage of the graduate credit hours required for the master's degree in Y that the Y-Program allows students to double-count between their undergraduate and graduate degrees. This upper limit applies to the total aggregate of graduate-equivalent credit hours from the two Utica

University eligible courses, and when applicable from undergraduate and/or graduate WPI courses, taken while the student was still an undergraduate at Utica University.

4. The name of a WPI faculty or staff member, hereby called *"WPI Y-Program Coordinator"* who will serve as the point of contact for the master's program in Y within this Collaborative Framework with Utica University. This master's-specific coordinator will work in collaboration with the WPI *Collaborative Framework Coordinator* on the academic aspects of the Collaborative Accelerated Master's Program in Y, and on providing academic advising to students in this Y-Program.

5. Endorsement from the faculty in the department or program that offers the master's degree in Y.

It is the responsibility of the *Collaborative Framework Coordinators* at WPI and at Utica University, in communication with the *WPI Y-Program Coordinator*, to keep all the information about the Collaborative Accelerated Master's Program in Y up-to-date, and to inform the counterparts at Utica University or at WPI promptly when a change occurs (e.g., a change in a course description or a change in degree requirements).

Rationale:

Benefits to Utica University and to WPI of this Collaborative Accelerated Master's Programs Framework:
This Collaborative Accelerated Master's Programs Framework strengthens collaborations between Utica University and WPI, and is beneficial for students, WPI, and Utica University.
This Collaborative Accelerated Master's Programs Framework helps highlight graduate options for Utica University undergraduate students. Students from Utica University can benefit from this Collaborative Accelerated Master's Programs Framework as it allows them to pursue their master's degrees at WPI in an accelerated manner. A master's degree will poise these students well for future employment and/or for entry into Ph.D. programs. Having an option for a graduate degree within the Southern New England high technology corridor can be attractive to students.
This Collaborative Accelerated Master's Programs Framework benefits Utica University by allowing it to attract and nurture students who are interested in pursuing their bachelor's and master's programs in a synergistic manner, and in disciplines that may not be available at Utica University at the graduate level.
This Collaborative Accelerated Master's Programs Framework benefits WPI by attracting external students with strong undergraduate training to pursue their master's degree at WPI.
WPI has a long tradition of offering the B.S./M.S. option to its students, either in the same department/program or in different departments/programs. This Collaborative Accelerated Master's Programs Framework between Utica University and WPI is inspired by WPI's internal B.S./M.S. option and will create a new type of collaboration between these two institutions and a pathway for students to obtain a bachelor's and a master's degrees in an accelerated and synergistic manner.

Design choices of the Collaborative Accelerated Master's Programs Framework:
The Collaborative Accelerated Master's Programs Framework described here follows all the internal WPI B.S./M.S. rules; it has been informed by the B.S./M.S. program descriptions in the WPI Graduate Catalog. There are numerous examples of B.S./M.S. students at WPI who have completed their B.S degree in a department or program (e.g., Physics) and their M.S. degree in a different department or program (e.g., Computer Science). WPI departments and programs that offer the B.S./M.S. option do regulate the M.S. portion of the degree (e.g., what undergraduate courses can be double-counted toward the M.S. degree). Same applies to this Collaborative Accelerated Master's Programs Framework. With a few exceptions (e.g., the B.S./M.S. options in Fire Protection Engineering and in Systems Engineering, which are mainly available to engineering undergraduate majors only), departments/programs' B.S./M.S. options at WPI are available to any WPI undergraduate major (see for example the B.S./M.S. option in Data Science in the Graduate Catalog). In that spirit, the proposed Collaborative Accelerated Master's Programs Framework

allows students to pursue a master's degree at WPI in a discipline related to, but not necessarily the same as, the discipline of their undergraduate major at Utica University.
The rules described here for students to register for courses at WPI while they are still undergraduate students at Utica University include the following:

- Undergraduate students are officially admitted to a CAMP pathway upon admission to the corresponding WPI MS program associated with that particular CAMP.
- Individuals admitted to a CAMP pathway officially become WPI MS students upon successful completion of their undergraduate degree at Utica University.
- Undergraduate students admitted to a CAMP pathway must complete a WPI BS/MS course designation form and submit to their academic advisor and appropriate WPI Pathway Coordinator (this information is communicated to the Registrars at both institutions).
- A maximum of two undergraduate courses from Utica University can be cross registered with WPI for a CAMP pathway. These undergraduate courses can only be selected from a list of approved courses specified by the faculty to support a specific CAMP pathway. These undergraduate courses can be completed prior to admission to a CAMP pathway.
- A maximum of two WPI graduate courses can be cross registered with Utica University for a CAMP pathway.
- WPI graduate courses can only be taken once a full-time matriculated undergraduate student from Utica University has been admitted to a CAMP pathway. Only one WPI graduate course can be taken per semester (Fall or Spring).
- A maximum of 10 undergraduate students from Utica University can be admitted to a specific CAMP pathway per year during a five-year time period with the option to update this limit at the end of the third year.

This agreement was approved by the WPI Provost in consultation with the WPI Registrar.
The limit of at most two undergraduate courses from Utica University to count for the master's degree at WPI has been adopted to satisfy requirements from the New England Commission of Higher Education (NECHE), as per conversations with NECHE's Senior Vice-President in the spring of 2023.
No special considerations are needed for this Collaborative Accelerated Master's Programs Framework regarding ABET accreditation as engineering master's degrees at WPI are not constrained by ABET accreditation rules.

Allowing students to take three "gap" years between completing their bachelor's degree at Utica University and starting their master's degree at WPI is consistent with WPI's own internal B.S./M.S. rules (which allow a 5-year gap). It accommodates potential changes of circumstances in students' lives and incentivizes students to come back for a graduate degree after spending time in industry or other endeavors, making the program more flexible and attractive.

Implementation Date: Implementation date for this action is AY2024-2025.

<u>Contacts for this Collaborative Accelerated Master's Programs Framework between Utica University and WPI:</u>

Contacts at WPI:

Collaborative Accelerated Master's Programs Framework Coordinator at WPI:

- Alexander Wyglinski, Associate Dean of Graduate Studies and Professor of Electrical and Computer Engineering

Faculty, Staff, and Administrators who have provided input for this Collaborative Accelerated Master's Programs Framework:

- Carolina Ruiz, Professor of Computer Science and Associate Dean of Arts and Sciences

- Faculty from all Schools, and numerous Department and Programs
- Committee on Graduate Studies and Research (CGSR)
- Mark Richman, Secretary of the Faculty
- Art Heinricher, Provost
- Arne Gericke, Dean of Undergraduate Studies
- Terri Camesano, Dean of Graduate Studies
- Jean A. King, Dean of Arts and Sciences
- John McNeill, Dean of Engineering
- Debora Jackson, Dean of The Business School
- Mimi Sheller, Dean of The Global School
- Carolina Ruiz, Associate Dean of Arts & Sciences
- Sarah Miles, Registrar
- Melissa Terrio, Executive Director of Graduate Recruitment and Admissions
- Scott Butler, Executive Director of Program Delivery and Strategic Partnerships
- Amy Fabiano, Associate General Counsel
- Pratap Rao, Associate Professor of Mechanical & Materials Engineering
- Sarah Wodin-Schwartz, Associate Teaching Professor of Mechanical & Materials Engineering and Associate Department Head

Contacts at Utica University:
Collaborative Accelerated Master's Programs Framework Coordinator at Utica University:

- Jon Gaffney, Assistant Professor of Physics

Other Faculty, Staff, and Administrators at Utica University:

- Javad Nia, Assistant Professor of Physics

Contacts at NECHE:

- The Senior Vice President of the New England Commission of Higher Education (NECHE), Patricia O'Brien, SNDdeN.