WORCESTER POLYTECHNIC INSTITUTE

February 14, 2024

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

The sixth Faculty meeting of the 2023-2024 academic year will be held on **Wednesday**, **February 14, 2024 at 11:00am in OH 107 and by Zoom at:** https://wpi.zoom.us/j/91035581068. 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 Jan. 17, 2024
2. Opening Announcements — M. Richman
3. President's Report — G. Wang
4. Committee Business:

   Committee on Graduate Studies and Research (CGSR) — S. Olson
   - **Motion to establish a template for Collaborative Accelerated Master's Programs Frameworks between Partner Institutions and WPI** — C. Ruiz
   - **Motion to establish a Collaborative Accelerated Master's Programs Framework between Assumption University and WPI**
   - **Motion to establish a Collaborative Accelerated Master's Program In Neuroscience between Assumption University and WPI**

   Committee on Appointments and Promotions (COAP) — P. Weathers

   Committee on Governance (COG) — G. Heineman
   - **Motion to modify to the description of materials collected by Joint Promotion Committees**
   - **Motion to add guidance for promotion to (full) Teaching Professor and Associate Teaching Professor in preparation of the promotion dossier -** for discussion only
   - **Motion to establish Interim Department Head Evaluations and to modify the manner in which the questionnaire is distributed –** for discussion only
5. Committee Report:

   Committee on Financial and Administrative Policy (FAP) — H. Walker
   - **Deliberations to eliminate one or retain both of WPI's two current retirement fund vendors (TIAA or Fidelity)**
6. New Business
7. Provost's Report — A. Heinricher
7. Closing Announcements
8. Adjournment

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WORCESTER POLYTECHNIC INSTITUTE
Faculty Meeting Minutes
January 17, 2024

Summary:

1. Call to Order; Approval of the Consent Agenda and the Minutes of December 6, 2023
2. Secretary of the Faculty's Report and Opening Announcements
3. President's Report
4. Committee Business: CGSR
5. Committee Report: CAP - Finding a Balance Between Academic Flexibility and Academic Standards
6. New Business
7. Closing Announcements
8. Adjournment

Detail:

1. Call to Order

The fifth Faculty Meeting of the 2023-2024 academic year was called to order at 11:00 am 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 agenda was approved with a minor modification, and the minutes from Dec. 6 were approved as distributed. Prof. Richman pointed out that in addition to the minutes, the consent agenda contained 78 motions from CAO and CGSR on behalf of BME, ECE, HUA, SSPS, BBT, AE, and RBE, which taken together represent a perfect example the careful attention that our faculty gives to its own curriculum. There were two minor changes in wording proposed by Prof. Billiar to the BME motions, which were accepted as friendly amendments. The motions in the consent agenda were approved as amended.

2. Opening Announcements

Prof. Richman pointed out that the next faculty meeting will be on Wednesday, February 14th at 11am.

Prof. Walker (CEAE; Chair, FAP) brought attention to current deliberations to move from two retirement plan vendors, Fidelity and TIAA, to a single retirement vendor. He encouraged all with an interest to attend either an in-person open meeting on Tuesday Jan. 23 from 2-3:30 pm in OH 107, or a Zoom meeting on Wednesday Jan. 24 from 1:30-3pm. These are opportunities to provide input on the process and learn the rationale behind making changes. Faculty Governance has provided some input via our FBC and FAP, but it is important for all community members to weigh in on this.

Prof. Richman (AE) asked if the decision to move to a single vendor has already been made. **Prof. Walker** stated that WPI appears to be moving pretty clearly to just one vendor. **Prof. Neamtu** (CS) asked if the open meetings carried any decision-making implications. **Prof. Walker** explained that at the very least, the decision about which vendor to choose has not been made.

3. President's Report

President Wang addressed a question that was asked at the Dec. 6 faculty meeting. As she saw it, the question was about the contrast between assurances that WPI is in a robust financial position, on the one hand, and the tight measures being taken with respect to budgeting and spending, on the other hand. She observed that WPI is in a reasonably healthy financial position. Current economic trends include a high inflation rate, the upcoming demographic cliff impacting enrollments particularly in the northeast, higher costs in higher education, and increasing discount rates. Consequently, WPI needs to be prudent about spending in order to maintain our healthy financial situation. President Wang understands that this has not been easy, and she thanked the community for its perseverance and collective efforts in these challenging times.

President Wang congratulated Prof. Rundensteiner and all those colleagues who were involved in seeing the AI Master's Degree Program through to faculty approval at the Dec. 6 faculty meeting. As many institutions are trying to launch similar programs, many of them are envious of the speed with which we established our new program.

More generally, the speed with which the faculty at WPI through its faculty governance can act to put new programs in place demonstrates a valuable technical institutional competency. She also thanked Dean King and Dean McNeill for their leadership in the AI initiative. We are now assessing the WPI resources that can be brought to support the AI program.

President Wang announced the President's Research Practice Fund, which is a gift from anonymous donors to provide seed funding for highly interdisciplinary, large-scale/Center-scale research efforts.

President Wang thanked all those so far involved in the Provost's search, which has already generated excitement and inquiries from across the country. She thanked Prof. Richman and Prof. Heineman for the collaboration to appoint members of the search committee. She encouraged everyone to speak to qualified candidates about applying for the position. She also thanked VP Turner (T&I) and her team who will support operational logistics for the search committee.

President Wang observed that 2024 marks the 50th anniversary of our first off-site global project center, which was established in Washington DC. As a point of pride, 85 percent of our students now go off-campus to gain full-time, highly immersed, project-based learning experience. She thanked all those colleagues who advise in our global project centers and support the administration and logistics of this global operation.

4. Committee Business

Committee on Graduate Studies and Research (CGSR)

Prof. Olson (MA, CGSR Chair), on behalf of the Committee on Graduate Studies and Research, explained that different groups across campus have been trying to develop pipelines of domestic or regional master's students for our master's programs. In particular, CGSR wants to ensure that the template for what are now called Collaborative Accelerated Master's Programs is understood before being finalized, and is bringing the current draft to today's meeting for discussion and additional feedback.

Prof. Ruiz (CS, Assoc. Dean A&S) explained that the proposal is to create a framework for Collaborative Accelerated Master's Programs between WPI and other partner institutions. The framework is inspired by our BS/MS program in the sense that students will complete a bachelor's degree and a master's degreenmwith some overlapping credit given for both degrees according to well-established rules for the double counting credits. In the case of Collaborative Accelerated Master's Programs, students complete their the bachelor's degrees at the partner institution and their master's degree at WPI. The proposed rules will allow two eligible senior undergraduate courses from partner institutions to count toward the master's program at WPI. All other rules for our BS/MS program apply to this program. (See **Addendum #1** on file with these minutes.)

Prof. Ruiz observed that this is a win for the students who will be accelerated in their pursuit of their master's degree, a win for WPI because it will allow us to attract strong students, and a win for the partner institutions because these pipelines are ways they can promote and encourage their students to complete master's degrees. Currently there are discussions to establish such programs with Assumption University, Holy Cross, Framingham State University, Utica University, and Smith College.

Prof. Ruiz focused on the first draft motion to establish a template for these programs, which provides the structure and the flexibility needed to develop the program with the partner institution, and creates no obligation for any program at WPI to participate. Specific programs can add additional rules or guidelines to build on the framework provided. The second draft motion is a general framework to be established with Assumption University, and the third motion contains a specific application of the framework to establish a Collaborative Accelerated Mater's Program in Neuroscience with Assumption University.

Prof. Ruiz explained that the standard template would facilitate the development of future collaborative accelerated master's programs, including maintaining the central role of CGSR approval and broad faculty approval, by standardizing the process and general rules to be followed. She also reviewed the rules and emphasized that they in no way give preference to non-WPI students over our own students.

Prof. Ruiz described how the template will be applied in the particular case of a Collaborate Accelerated Master's Program Framework that is currently under development with Assumption University, and in the particular sub-case of a Collaborate Accelerated Master's Program with Assumption University in Neuroscience.

Prof. Ruiz pointed out the wide range of campus individuals (including individual faculty members, the Neuroscience faculty, CGSR members, Secretary of the Faculty, Provost, Deans, Registrar, Graduate Studies, OGC) who have been involved and have provided support for the development of these programs, so far.

Prof. Weathers (BBT) asked how the number of credits for the two double-counted courses would be determined. In particular, she was concerned about how a four-credit course at a partner institution would be counted toward the WPI master's degree. **Prof. Ruiz** clarified that the typical number of credits would be three credits for each course, so typically six credits (for two courses) would be counted toward both degrees. She also pointed out that a maximum of 40 percent of the graduate credits in the BS/MS programs at WPI can be double counted.

Prof. Shue (CS) recognized how difficult it is to establish a new WPI program, no less a rubric for a class of programs at WPI, no less a rubric for programs at WPI involving outside universities. So he thought the work done so far on these programs represented a significant accomplishment. He also added that the Computer Science Department has been involved in discussions about such degree programs in cybersecurity and he is excited to continue those efforts.

Prof. Moody (HUA), in response to a Zoom intrusion that was not seen or heard by those attending the meeting in person, acknowledged the terribly violent and racist things that those on Zoom heard and saw. The intrusion prevented her from hearing or focusing on Prof. Ruiz's presentation. Prof. Moody was certain that the intrusion evoked extremely uncomfortable feelings for those attending the meeting remotely.

Prof. Richman thanked Prof. Moody for her comments and could only imagine what the experience was like from the echo we in OH 107 are now hearing from those on Zoom. Prof. Richman commented on the unfortunate nature of the intrusion and reported that, even from the brief conversations he's already had with Kate Beverage (Dir. Tech for Teaching and Learning), we will take appropriate measures to ensure that such an intrusion does not occur again and to be better prepared if it does. He reported that the intruders had been removed from the meeting and that the meeting was locked so that no one else could enter. In the meantime, despite not having heard or seen the violence but sensing its offensive content from comments and text messages from others who had, on behalf of the WPI faculty Prof. Richman denounced these hateful acts in the strongest terms. Prof. Richman also expressed his strongest regret about any attempt to lower the civil discourse on which we pride ourselves at WPI. Finally, Prof. Richman thanked all the people on the Zoom for bearing up to this most inappropriate and discomforting assault, and he thanked Professor Moody, in particular, for sharing her first -hand experience for all to understand.

Prof. Rundensteiner (CS) returned to the CGSR discussion and expressed her strong support for the CGSR proposal. She asked if, in addition to the two undergraduate courses, WPI graduate courses taken by undergraduate students at the partner universities could also be double counted toward both degrees. **Prof. Ruiz** explained that it is a detail that could be worked out as part of the framework and is related to decisions that the partner institutions would have to make about the credits they would allow to be counted toward their bachelor's degrees.

Prof. Richman encouraged others to provide additional feedback to Prof. Ruiz or to CGSR before the motions are brought back for votes next month.

5. Committee Report:

Committee on Academic Policy (CAP):

Prof. Calli (RBE, CAP Chair) presented on behalf of the Committee on Academic Policy, which is seeking faculty input on two very much related topics. He explained that CAP seeks input here, by email, and via online forms that will be distributed to the faculty. The first topic, finding balance between providing academic flexibility and maintaining academic standards, emerges from a trend in student behavior particularly during the past three years. Faculty members have been receiving requests from students to extend assignment deadlines, to provide additional assignments, and to offer makeup exams. In requesting these allowances, students point to mental health concerns or feeling overwhelmed, they say they deserve higher grades, or they give no reason at all. He acknowledged that these requests can be challenging and put individual faculty members in difficult situations, leading to increased

faculty anxiety and workloads as they try to preserve the course objectives while meeting student requests. As an additional challenge, faculty members cannot ask for health reports due to privacy concerns. (See **Addendum #2** on file with these minutes.)

Prof. Calli reported that CAP is working with Dr. Paula Fitzpatrick (Dir. WPI's Center for Wellbeing) and Charlie Morse, (Dean of Student Wellness), who approached CAP with the goal of developing a policy that compassionately balances the need for structure and flexibility, that is transparent and accessible to all students, and that allows all students some flexibility without negative consequences. Prof. Calli noted that *excessive* flexibility can negatively affect student wellbeing and performance, as well, and he explained that the goal of these efforts is to find a balance between structure and flexibility and provide transparency to students about the rules. Prof. Calli asked if it were possible to improve student well-being, faculty well-being and course objectives simultaneously, even when the three might appear to be in conflict? Prof. Calli invited faculty to offer recommendations, strategies that have worked for them, and challenges they face. Responses can be sent to gr-cap2023@wpi.edu or submitted via a form that would be made available next week. Prof. Calli opened the floor to comments.

Prof. Kmiotek (CHE) explained that he uses a mix of highly flexible deadlines for low-stakes assignments and inflexible deadlines for high-stakes assignments. He lets the students know in advance which deadlines are which and has found this works well.

Prof. Weathers (BBT) has noticed that many high achieving students overextend themselves in non-academic areas, which causes them a lot of problems. These activities are important to them but don't leave enough time for MQPs, for example. She is not sure how to deal with it, but it is something that we need to consider helping these students.

Prof. Smith (CS) added that she sees students overextending themselves in academic areas as well, some assuming heavy overloads and many of them struggling with perfectionism where everything needs to be done incredibly well or it isn't done at all. She added that in IMGD they are trying to promote the idea that "done" is sometimes good enough, and that it is even okay to fail. Any guidance for the faculty should include the sense that a successful career is not contingent on perfect performance and we shouldn't demand that high standard from our students.

Prof. Demetry (MME) suggested that these efforts should result in flexible guidelines rather than rigid policies. What faculty members are able to do depends on their own situation. The same policies about flexibility can result in very different faculty workloads depending on factors such as gender and race. **Prof. Calli** indicated that the intent is to develop guidelines and an inventory of tools that faculty members may adopt if they choose.

Prof. Neamtu (CS) welcomed this long overdue conversation. She thought we should tell students that sometimes things happen in life and when they do, mental health should lead the way, not academics. She suggested that we should be helping students learn to deal with hardship, and to do so faculty members need help from the Center for Wellbeing and from other staff members who can help with difficult conversations. In addition to guidelines for the faculty, she called for guidelines for students to help them set reasonable expectations for themselves.

Prof. Boudreau (HUA) appreciated that we were having this open conversation. She reminded everyone that our mantra used to be: go to class; do the work; and ask for help. She is seeing more and more students who disappear and don't know how to ask for help, students who fall behind and stop coming to class. She would like us to not only remind them of their responsibility but also help them learn how to reach out for help.

Prof. Rosewitz (CEAE) has observed a trend of students requesting a grade of NR when they realize they won't earn an A. She urged her colleagues to consider not only encouraging good habits in students, but also discouraging negative behaviors.

Prof. Crowe (HUA) explained that he encourages his students to come talk to him ahead of deadlines if they anticipate a problem meeting a deadline and that has helped students be more organized and to plan ahead. He tells them he can be flexible on short notice for illnesses or other unanticipated events but noted positive results from advance student planning.

Prof. Walker (CEAE) noted two structural factors that add stress: the seven-week terms give little room for students to recover from an event, and the stark difference between discrete letter grades adds stress. Though he's not sure we want to change either factor, we should think about whether we can reduce their impact.

Prof. Fehribach (MA) observed that even occasional students trying to game the system with multiple requests for accommodations can overwhelm an instructor. He encouraged the drafters of these guidelines to consider students looking to take unfair advantage of flexibility.

A motion to extend the meeting was approved.

Committee on Academic Policy (CAP):

Prof. Calli introduced the second related report on grading practices. He indicated at the outset that CAP is not taking a position against current grading practices, only presenting information and suggesting its implications for the faculty's consideration. He shared data indicating that the number of A's awarded has been slowly increasing since AY16-17, particularly in third- and fourth-year courses. He noted that other universities are also confronting this issue and shared a recent New York Times headline indicating that close to 80 percent of grades at Yale University were in the A range last year. He displayed WPI's grading standards for projects and courses and noted that major project grades have always been higher than course grades. He asked whether WPI faculty are following the guidelines for grades. (See **Addendum #2** on file with these minutes.)

Prof. Calli then laid out some of the results of these rising grades. Between AY16-17 and AY22-23, the fraction of our students on the Deans' List has risen from 33 percent to 43 percent, which greatly exceeds the 25 percent originally anticipated. Likewise, significantly more students qualify as Charles O. Thompson scholars than originally intended. Prof. Calli explained that CAP is discussing whether this trend is a problem and, if so, what should be done about it. Options include: making no changes; changing the criteria for the Dean's List; eliminating the Dean's List (which might address some of the concerns raised in the previous discussion about student overemphasis on grades); or encouraging faculty to more closely follow the grading guidelines. He also noted that a growing community of faculty members are practicing "ungrading" with good results. He opened the floor to discussion after indicating that responses may also be submitted to gr-cap2023@wpi.edu or via the online forms that will be circulated.

Prof. Fehribach (MA) observed that we are attracting better students now than we did 25 years ago. Whereas the average student in the 1990s started in Calculus 1, just before COVID the average student started Calculus 3. There are also far more students who start in Calculus 4 and beyond. Better students may be one reason for their higher grades.

Prof. Wyglinski (ECE, Assoc. Dean of Graduate Studies) suggested that our restriction to whole-letter grades creates a wide spectrum of student performance within a single letter grade. He suggested that more finely differentiated grades would help faculty members assign more precise grades.

Prof. Danielski (HUA) observed that for students planning to attend graduate school, grades are very important for admission. Given that grades at prestigious universities like Yale are also being inflated, is it fair to give more realistic grades to WPI students and put them at a competitive disadvantage? **Prof. Calli** noted that, according to the *New York Times* article he cited, that is also Yale's concern.

Prof. Troy (BME) stated that while she assigns an A grade to her many students who do a very good job, she also regrets that she has no way to distinguish her truly exceptional students. She considers that one option is to make the course harder so fewer students earn an A, but that goal would compete with her course objectives.

Dean McNeill (ENG) asked if students themselves believe that too many of their peers are making the Dean's List. **Prof. Calli** reported that the students solicited by CAP have expressed some concerns that grades are getting cheaper and that they want people who evaluate their transcripts to know that not every WPI student gets an A. However, he also noted that this student feedback comes from the WPI Student Council, which may not be a representative sample.

Prof. Hansen (HUA) suggested asking for student feedback at an open forum. He supports keeping the Dean's List as it markets our success to others. Although we have a collective responsibility to think about the standards we have, if a student performs well, they should be recognized.

Prof. Ruiz (CS) encouraged everyone to think about what we can do not only to help students learn well but also to reduce the pressure they experience. She thought that a pass/fail grading option makes sense and that a Dean's List provides unnecessary stress for the students.

Prof. Walker added that we should discuss the NR grade, which keeps WPI GPAs higher than those at our peer institutions.

6. New Business
There was no new business.

7. Closing Announcements
Prof. Kafle (PH, CASL) announced that on February 7th from 12-2PM in Unity Hall 520, the Morgan Center and CASL will be hosting a just-in-time advising training session designed to support faculty in preparing for an effective Academic Advising Day in C Term. Speakers at the session will guide faculty through topics like how to advise students about curricular requirements, where to locate advising resources, and how to work effectively with the Office of Academic Advising. This session, which includes a boxed lunch for those who register in advance, is geared to our early career faculty, but it is also just as valuable for any faculty member who would like a refresher on these topics.

Prof. Demetry (MMS), on behalf of the Provost Office and the Faculty Working Group, announced that WPI will be participating in the COACHE (Collaborative on Academic Careers in Higher Education) Faculty Job Satisfaction Survey beginning in February. This is a faculty survey administered by a research group at Harvard Graduate School of Education and is more comprehensive than most job satisfaction surveys. It covers all aspects of our work environment and workplace climate., and it enables us to do external benchmarking to better understand the range of experiences of faculty within and beyond our community.

All full-time faculty members will be invited to participate in the survey, designed to provide a nuanced picture of experiences by career stage and by track and contract status. As in the past, the data received from COACHE after the survey is complete will be made available to all faculty members. There are also robust protections for anonymity; nobody can be identified by anyone at either Harvard or WPI. As we have used past COACHE survey data to change our promotion process and criteria, this year's results can be used start new conversations, ask deeper questions and ultimately take actions that make WPI a better place for faculty. In addition, this year provides an opportunity for us to influence the early understandings and priorities of the incoming provost. (See **Addendum #3** on file with these minutes.)

8. Adjournment
Meeting was adjourned at 12:47pm by **Prof. Richman**.

Respectfully submitted,

Mark Richman
Secretary of the Faculty

Addenda on file with these minutes:
Addendum #1 - CGSR Presentation on Collaborative Accelerated Masters Programs - Minutes Jan 17, 2024
Addendum #2 - CAP Presentation on Balance between Flexibility and Standards - Minutes Jan 17, 2024
Addendum #3 - Prof Demetry Presentation on COACHE Survey - Minutes Jan 17, 2024

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to establish a Template for Collaborative Accelerated Master's Programs Frameworks between Partner Institutions and WPI

Motion: On behalf of the Collaborative Accelerated Master's Programs (CAMPs) Frameworks Working Group, the Committee on Graduate Studies and Research recommends, and I move, that the template for future Collaborative Accelerated Master's Programs Frameworks between partner institutions and WPI be established, as described below.

Description of the Motion:

Proposed Catalog Description: *To be included in the "Graduate Degrees and Certificates" Section of the WPI Graduate Catalog, which describes graduate degrees and programs offered at WPI:*

> **Collaborative Accelerated Master's Programs Frameworks between WPI and Partner Institutions**
> WPI has established Collaborative Accelerated Master's Programs (CAMPs) Frameworks with key partner institutions. A CAMPs Framework between WPI and a partner institution is a cross-institutional collaboration in which undergraduate students at the partner institution can apply to and, after graduating with their bachelor's degree at the partner institution, pursue a master's degree at WPI in an accelerated manner. These collaborative frameworks may include B.A., B.S. and other bachelor's degrees at the partner institution and any opting-in master's degree programs at WPI (including but not limited to M.S. degrees).

Summary:
This motion consists of two parts:

- **Part I**: **Collaborative Accelerated Master's Programs Frameworks between Partner Institutions and WPI**
  Part I describes the notion of a Collaborative Accelerated Master's Programs (CAMPs) Framework between WPI and a partner institution, in which undergraduate students at the partner institution, after graduating with their bachelor's degree, may pursue a master's degree at WPI in an accelerated manner. Part I also provides a template with general rules and guidelines to facilitate the creation of a Collaborative Accelerated Master's Programs Framework with a partner institution.

- **Part II: Collaborative Accelerated Master's Programs between partner institution X and WPI**
  Once a Collaborative Accelerated Master's Programs Framework between WPI and a given partner institution has been established, any department or program at WPI that confers a master's degree may opt-in to participate in said Collaborative Framework. Part II provides a template for the creation of a master's-specific Collaborative Accelerated Master's Program (e.g., an accelerated master's program in Computer Science) within a Collaborative Accelerated Master's Programs Framework with the partner institution, in which additional information and rules specified by the opting-in, accelerated master's program (e.g., M.S. in Computer Science) at WPI are provided.

Part I: Collaborative Accelerated Master's Programs Frameworks between Partner Institutions and WPI

Summary Description: A Collaborative Accelerated Master's Programs (CAMPs) Framework between WPI and a partner institution is a cross-institutional collaboration in which undergraduate students at the partner institution can apply to and, after graduating with their bachelor's degree at the partner institution, pursue a master's degree at WPI in an accelerated manner. These collaborative frameworks may include B.A., B.S. and other bachelor's degrees at the partner institution and any opting-in master's degree programs at WPI (including but not limited to M.S. degrees).

Anyone at WPI may spearhead the creation of a Collaborative Accelerated Master's Programs Framework with a new partner institution. To establish such a Collaborative Accelerated Master's Programs Framework with a specific partner institution, WPI, in collaboration with the partner institution, shall develop an instantiation and/or adaptation of the template provided below, specific to the partner institution, for consideration and approval by the WPI Committee on Graduate Studies and Research (CGSR) and subsequently by the WPI Faculty.

For simplicity, the partner institution is denoted by "X" in the remainder of this document.

Once a Collaborative Accelerated Master's Programs Framework between WPI and partner institution X has been established, any department or program at WPI that confers a master's degree may opt-in to participate in said Collaborative Framework. Part II describes a template for individual WPI master's programs (e.g., M.S in Computer Science) to opt-in to participate by creating a Collaborative Accelerated Master's Program (CAMP) in its field (e.g., Computer Science) within a Collaborative Accelerated Master's Programs Framework between X 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 partner institution X and WPI.

1. Framework Description

This Collaborative Accelerated Master's Programs Framework between X and WPI allows undergraduate students from X to apply to and, after graduating with their bachelor's degree from X, pursue a master's degree at WPI in an accelerated manner. This may include B.A., B.S., and other bachelor's degrees at X, 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 X 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 courses from X 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 X 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 X and WPI. For simplicity, this specific master's degree program will be denoted by "Y" from now on.

In order to opt-in, a WPI master's program Y shall, in consultation with the *Collaborative Framework Coordinators* at X 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 X 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 confers said 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 X 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 X and at WPI for special eligibility consideration. Interested students should seek academic advice from the *Collaborative Framework Coordinators* at X and at WPI, their academic advisor at X, 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 X. 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 X. 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 X. 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 X.

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 X and register for graduate courses at WPI.

4. Course Registration for HECCMA Partner Institutions Only
Consistent with the Higher Education Consortium of Central Massachusetts (HECCMA) rules, full-time, matriculated, undergraduate students at X are eligible to cross-register for fall and spring courses at WPI. Only two cross-registration courses per academic year are permitted. Undergraduate courses taken through cross-registration require no additional tuition. For students admitted to a Collaborative Accelerated Master's Program in Y as part of this Collaborative Accelerated Master's Programs Framework between X and WPI, this tuition benefit is extended to include up to two graduate courses taken at WPI while they are still undergraduate students at X.

Undergraduate students from X planning to register for WPI courses should consult with their academic advisors and with the *WPI Y-Program Coordinator* to make sure that they have the necessary course prerequisites and/or recommended background before registering for a WPI course.

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 X 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 X, the *WPI Y-Program Coordinator* of the specific master's program being pursued by the student, the *Collaborative Framework Coordinators* at X 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

- 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 X that satisfy all of the following conditions:
    - The course is included on the list of eligible courses from X 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 X.
- If applicable, eligible 4000-level or graduate level courses taken at WPI while the student is still an undergraduate at X 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 X.
- All other existing WPI credit transfer and double-counting rules apply to students in this collaborative framework. In particular, 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 X eligible courses, and when applicable from undergraduate and/or graduate WPI courses, taken while the student was still an undergraduate at X. 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, undergraduate courses from X 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 X and WPI will be jointly administered by a *Collaborative Framework Coordinator* at X 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 partner institution X 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 X and WPI. To opt-in, the department or program shall, in consultation with the *Collaborative Framework Coordinators* at X 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 X and WPI, and must provide the information listed in the template below.

Template: Collaborative Accelerated Master's Program in Y between partner institution X and WPI

This document must include:

1. Additional eligibility criteria, if any, for students from X 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 X 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 X 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 X 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 X.
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 X 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 X eligible courses, and when applicable from undergraduate and/or graduate WPI courses, taken while the student was still an undergraduate at X.

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 X. 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 X, 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 X 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 Partner Institution X and to WPI of this Collaborative Accelerated Master's Programs Framework:

Partnerships like this one strengthen collaborations between WPI and our partner institutions, and are beneficial for students, WPI, and our partner institutions.

This Collaborative Accelerated Master's Programs Framework helps highlight graduate options for undergraduate students from our partner institutions. Students from X 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. In the case of partner institutions

in the greater Worcester area, having a local option for a graduate degree can be attractive to students.

This Collaborative Accelerated Master's Programs Framework benefits X 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 X 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 Worcester, in the case of local partner institutions) to pursue their master's degree at WPI.

WPI has a long tradition of offering the B.S./M.S. option to its students, where the master's degree is in the same department/program or in a different department/program of their bachelor's degree. This Collaborative Accelerated Master's Programs Framework between X 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 X.

In the case of partner institutions that are part of the Higher Education Consortium of Central Massachusetts (HECCMA), the rules described here for students to register for courses at WPI while they are still undergraduate students at X are consistent with the cross-registration policies established by HECCMA. This Collaborative Accelerated Master's Programs Framework extends these policies by (1) allowing students from X to cross-register for up to two WPI courses per academic year, which is more flexible than the standard HECCMA policy of up to one course per semester; and (2) allowing students from X admitted to a Y-Program within this Collaborative Accelerated Master's Programs Framework to take up to two WPI graduate courses while they are still undergraduate students at X without paying additional tuition. These extended benefits were approved by the WPI Provost and agreed upon with the WPI Registrar.

The limit of at most two undergraduate courses from X 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 X 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.

Impact on Degree Requirements: None.

Resources Needed: At WPI, resources are needed to appoint and incentivize a WPI *Collaborative Framework Coordinator* to administer and oversee this Collaborative Accelerated Master's Programs Framework between X and WPI, and to serve as the general WPI advisor for students in any of the Collaborative Accelerated Master's Program in Y within this Framework.

Implementation Date for the General Template for Collaborative Accelerated Master's Programs Frameworks between WPI and Partner Institutions: Implementation date for the adoption of this general template for Collaborative Accelerated Master's Programs (CAMPs) Framework between WPI and partner institutions is upon this motion's approval by the WPI Faculty.

Contacts for the General Template for Collaborative Accelerated Master's Programs Frameworks between WPI and Partner Institutions:

General Collaborative Accelerated Master's Programs Framework Architect at WPI:

- Carolina Ruiz, Professor or Computer Science and Associate Dean of Arts and Sciences *Faculty, Staff, and Administrators who have provided input for this General Collaborative Accelerated Master's Programs Framework:*
  - WPI Faculty from numerous Schools, Department and Programs
  - WPI Committee on Graduate Studies and Research (CGSR)
  - WPI Secretary of the Faculty, Mark Richman
  - WPI Provost, Art Heinricher
  - WPI Dean of Graduate Studies, Terri Camesano
  - WPI Dean of Arts and Sciences, Jean A. King
  - WPI Dean of Engineering, John McNeill
  - WPI Dean of The Business School, Debora Jackson
  - WPI Dean of The Global School, Mimi Sheller
  - WPI Dean of Undergraduate Studies, Arne Gericke
  - WPI Associate Dean Graduate Studies, Alexander Wyglinski
  - WPI Registrar, Sarah Miles
  - WPI Executive Director of Graduate Recruitment and Admissions, Melissa Terrio
  - Executive Director, Program Delivery and Strategic Partnerships, Scott Butler
  - WPI Associate General Counsel, Amy Fabiano
  - Counterparts at partner institutions, including Assumption University and Holy Cross
  - The Senior Vice President of the New England Commission of Higher Education (NECHE), Patricia O'Brien, SNDdeN.

Implementation Date for the Collaborative Accelerated Master's Programs Framework between X and WPI: Implementation date for the establishment at WPI of this Collaborative Accelerated Master's Programs Framework between X and WPI is AY20ZZ-20(ZZ+1).

Contacts for the Collaborative Accelerated Master's Programs Framework between X and WPI:

Contacts at WPI:

Collaborative Accelerated Master's Programs Framework Coordinator at WPI: < name>

Other WPI Faculty, Staff, and Administrators:

- *<include names>*

Contacts at X:

Collaborative Accelerated Master's Programs Framework Coordinator at X: <include name>

Other Faculty, Staff and Administrators at X:

- *<include names>*

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to establish a Collaborative Master's Programs Framework between Assumption University and WPI

Motion: On behalf of the Collaborative Accelerated Master's Programs (CAMPs) Framework between Assumption University and WPI Working Group, the Committee on Graduate Studies and Research recommends, and I move, that the Collaborative Master's Programs Framework between Assumption 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 Assumption University and WPI**
  Part I establishes a Collaborative Accelerated Master's Programs (CAMPs) Framework between Assumption University and WPI, in which undergraduate students at Assumption 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 Assumption 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 Assumption 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 Assumption 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 Assumption University and WPI.
The Collaborative Accelerated Master's Programs Framework between Assumption University and WPI allows undergraduate students from Assumption University to apply to and, after graduating with their bachelor's degree from Assumption 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 Assumption, 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 Assumption 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 Assumption 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 Assumption University students, together with specific program-specific eligibility and degree requirements.

Summary Description: This part establishes a Collaborative Accelerated Master's Programs Framework between Assumption University and WPI, in which undergraduate students at Assumption University can apply to and, after graduating with their bachelor's degree from Assumption, 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 Assumption 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 Assumption 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 Assumption University and WPI.

1. Framework Description

This Collaborative Accelerated Master's Programs Framework between Assumption University and WPI allows undergraduate students from Assumption University to apply to and, after graduating with their bachelor's degree from Assumption, pursue a master's degree at WPI in an accelerated manner. This may include B.A., B.S., and other bachelor's degrees at Assumption, 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 Assumption 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 Assumption 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 Assumption 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 Assumption University and WPI. For simplicity, this specific master's degree program will be denoted by "Y" from now on.

In order to opt-in, a WPI master's program Y shall, in consultation with the *Collaborative Framework Coordinators* at Assumption 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 Assumption 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 Assumption 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 Assumption University and at WPI for special eligibility consideration. Interested students should seek academic advice from the *Collaborative Framework Coordinators* at Assumption University and at WPI, their academic advisor at Assumption 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 Assumption 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 Assumption 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 Assumption 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 Assumption 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 Assumption University and register for graduate courses at WPI.

4. Course Registration

Consistent with the Higher Education Consortium of Central Massachusetts (HECCMA) rules, full-time, matriculated, undergraduate students at Assumption University are eligible to cross-register for fall and spring courses at WPI. Only two cross-registration courses per academic year are permitted. Undergraduate courses taken through cross-registration require no additional tuition. For students admitted to a Collaborative Accelerated Master's Program in Y as part of this

Collaborative Accelerated Master's Programs Framework between Assumption University and WPI, this tuition benefit is extended to include up to two graduate courses taken at WPI while they are still undergraduate students at Assumption University.
Undergraduate students from Assumption University planning to register for WPI courses should consult with their academic advisors and with the *WPI Y-Program Coordinator* to make sure that they have the necessary course prerequisites and/or recommended background before registering for a WPI course.

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 Assumption 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 Assumption University, the *WPI Y-Program Coordinator* of the specific master's program being pursued by the student, the *Collaborative Framework Coordinators* at Assumption 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

- 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 Assumption University that satisfy all of the following conditions:
    - The course is included on the list of eligible courses from Assumption 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 Assumption University.
- If applicable, eligible 4000-level or graduate level courses taken at WPI while the student is still an undergraduate at Assumption 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 Assumption University.

- All other existing WPI credit transfer and double-counting rules apply to students in this collaborative framework. In particular, 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 Assumption University eligible courses, and when applicable from undergraduate and/or graduate WPI courses, taken while the student was still an undergraduate at Assumption 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, Assumption 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 Assumption University and WPI will be jointly administered by a *Collaborative Framework Coordinator* at Assumption 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 Assumption 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 Assumption University and WPI. To opt-in, the department or program shall, in consultation with the *Collaborative Framework Coordinators* at Assumption 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 Assumption University and WPI, and must provide the information listed in the template below.

Template: Collaborative Accelerated Master's Program in Y between Assumption University and WPI

This document must include:

1. Additional eligibility criteria, if any, for students from Assumption 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 Assumption 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 Assumption 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 Assumption 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 Assumption 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 Assumption 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 Assumption University eligible courses, and when applicable from undergraduate and/or graduate WPI courses, taken while the student was still an undergraduate at Assumption.

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 Assumption 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 Assumption 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 Assumption 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 Assumption University and to WPI of this Collaborative Accelerated Master's Programs Framework:

This Collaborative Accelerated Master's Programs Framework strengthens collaborations between Assumption University and WPI, and is beneficial for students, WPI, and Assumption University.

This Collaborative Accelerated Master's Programs Framework helps highlight graduate options for Assumption University undergraduate students. Students from Assumption 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 Assumption 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 Assumption 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 Worcester) 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 Assumption 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 Assumption University.

The rules described here for students to register for courses at WPI while they are still undergraduate students at Assumption University are consistent with the cross-registration policies established by the Higher Education Consortium of Central Massachusetts (HECCMA). This Collaborative Accelerated Master's Programs Framework extends these policies by (1) allowing students from Assumption University to cross-register for up to two WPI courses per academic year, which is more flexible than the standard HECCMA policy of up to one course per semester; and (2) allowing students from Assumption University admitted to a Y-Program within this Collaborative Accelerated Master's Programs Framework to take up to two WPI graduate courses while they are still undergraduate students at Assumption University without paying additional tuition. These extended benefits were approved by the WPI Provost and agreed upon with the WPI Registrar.

The limit of at most two undergraduate courses from Assumption 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 Assumption 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.

Impact on Degree Requirements: None.

Resources Needed: At WPI, resources are needed to appoint and incentivize a WPI *Collaborative Framework Coordinator* to administer and oversee this Collaborative Accelerated Master's Programs Framework between Assumption University and WPI, and to serve as the general WPI advisor for students in any of the Collaborative Accelerated Master's Program in Y within this Framework.

Implementation Date: Implementation date for this action is AY2024-2025.

Contacts for this Collaborative Accelerated Master's Programs Framework between Assumption University and WPI:

Contacts at WPI:

Collaborative Accelerated Master's Programs Framework Coordinator at WPI:

- Carolina Ruiz, Professor of Computer Science and Associate Dean of Arts and Sciences *Faculty, Staff, and Administrators who have provided input for this Collaborative Accelerated Master's Programs Framework:*
  - 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
  - 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
  - Arne Gericke, Dean of Undergraduate Studies
  - Alexander Wyglinski, Associate Dean Graduate Studies
  - 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

Contacts at Assumption University:

Collaborative Accelerated Master's Programs Framework Coordinator at :

- Michele Lemons, Professor of Biology and Director of Center for Neuroscience

Other Faculty, Staff, and Administrators at Assumption University:

- Brian Niece, Chairperson of Biological and Physical Sciences
- Stuart Cromarty, Professor of Biology
- Nikos Lessios, Assistant Professor of Biology
- Anthony Saccino, Assistant Professor of Practice, Biology
- Lea Gordon, Chairperson of Psychology
- Jessica McCready, Chairperson of Mathematics and Computer Science
- Marc Guerra, Provost
- Michelle Graveline, Interim Dean of the D'Amour College of Liberal Arts and Sciences
- Heather Pecoraro, Registrar
- Christina Graziano, General Counsel and VP for Strategy

Contacts at NECHE:

- The Senior Vice President of the New England Commission of Higher Education (NECHE), Patricia O'Brien, SNDdeN.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to establish a Collaborative Accelerated Master's Program (CAMP) in Neuroscience between Assumption University and WPI

Motion: On behalf of the WPI Neuroscience Program, the Committee on Graduate Studies and Research recommends, and I move, that the Collaborative Accelerated Master's Program (CAMP) in Neuroscience between Assumption University and WPI be established, as described below.

Description of the Motion:

Proposed Catalog Description*: To be included in the Neuroscience Program section of the WPI Graduate Catalog, which describes the degree programs offered by the Neuroscience Program.*

Collaborative Accelerated M.S. Program in Neuroscience between Assumption University and WPI.

The Collaborative Accelerated Master's Program (CAMP) in Neuroscience between Assumption University and WPI allows undergraduate students at Assumption University, after graduating with their bachelor's degree, to pursue an M.S. degree in Neuroscience at WPI in an accelerated manner. Assumption University students in majors relevant to Neuroscience (including, Neuroscience, Biology, Biotechnology and Molecular Biology, Chemistry, Computer Science, Health Sciences, Mathematics, and Psychology) or who otherwise have the necessary coursework may be eligible for this program.

Students in this accelerated M.S. program must satisfy all the requirements of their bachelor's degree at Assumption University and all the requirements of their master's degree in Neuroscience 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 Assumption University courses. Further information about this program, including eligibility criteria, application process, course double-counting rules, and degree requirements is available at https://www.wpi.edu/academics/departments/neuroscience.

Assumption University students interested in this accelerated M.S. Program in Neuroscience at WPI are encouraged to consult with their undergraduate academic advisor and the Director of Neuroscience at Assumption University, as well as with the WPI Neuroscience Director, about course selection that would best prepare them for the M.S. degree in Neuroscience at WPI.

Summary:
This motion establishes a Collaborative Accelerated Master's Program (CAMP) in Neuroscience between Assumption University and WPI, in which undergraduate students at Assumption University, after graduating with their bachelor's degree, may pursue an M.S. degree in Neuroscience at WPI in an accelerated manner. This accelerated master's program is part of the Collaborative Accelerated Master's Programs (CAMPs) Framework between Assumption University and WPI. This accelerated master's program complies with all the rules described in the Collaborative Accelerated Master's Programs Framework between Assumption University and WPI and with all the rules of the WPI M.S Program in Neuroscience. This motion describes

additional rules and information specific for undergraduate students from Assumption University who wish to apply to and pursue an M.S. in Neuroscience at WPI in an accelerated manner.

Collaborative Accelerated Master's Program in Neuroscience between Assumption University and WPI

In addition to the rules and regulations provided in the general Collaborative Accelerated Master's Programs Framework between Assumption University and WPI, the following sections provide additional information and rules specific to students who wish to obtain their M.S. degree in Neuroscience at WPI as part of this Collaborative Accelerated Master's Programs Framework between Assumption University and WPI.

1. Additional Eligibility Criteria

Assumption University students in majors relevant to Neuroscience (including, Neuroscience, Biology, Biotechnology and Molecular Biology, Chemistry, Computer Science, Health Sciences, Mathematics, and Psychology) or who otherwise have the necessary coursework are eligible for this Collaborative Accelerated Master's Program in Neuroscience. Other eligibility criteria described in the general Collaborative Accelerated Master's Programs Framework between Assumption University and WPI apply.

2. Recommended Background, Prerequisites, and Additional Guidelines for this Collaborative Accelerated M.S. Program in Neuroscience

Eligible Assumption University students wishing to pursue an accelerated M.S. in Neuroscience at WPI are encouraged to consult with their own undergraduate academic advisor, the Director of Neuroscience at Assumption University, and the WPI Neuroscience Coordinator at WPI (names provided later in this document) about course selection that would best prepare them for the M.S. degree in Neuroscience at WPI. The Plan of Study included in this document provides detailed information about courses at Assumption University and at WPI that may count toward the M.S. degree in Neuroscience at WPI. General rules for course-counting and other important information are included in the description of the Collaborative Accelerated Master's Programs Framework between Assumption University and WPI.

Unless otherwise noted, Assumption University 4-credit undergraduate courses carry 3 WPI graduate credits; and Assumption University 3-credit undergraduate courses carry 2 WPI graduate credits. WPI 3-credit graduate courses carry 3 credits at Assumption University; and WPI 3-credit undergraduate courses carry 3 credits at Assumption University. Please note that WPI undergraduate courses are subject to an internal credit conversion when being counted for a WPI graduate degree, with 3 WPI undergraduate credits being equivalent to 2 WPI graduate credits.

Assumption University courses eligible toward the M.S. degree in Neuroscience at WPI:
See the Plan of Study Form included in this document for further details.

- Courses that count toward the M.S. degree's core or elective coursework requirement in Neuroscience:
    - BIO415 Principles of Neuroscience (4 undergraduate credits)
        - Students in the program can receive credit towards their M.S. degree for BIO415 or for NEU501, but not for both.
    - BIO490 Independent Study with Neuroscience Focus (3 undergraduate credits)
        - This ISC may be conducted with Assumption University and/or WPI faculty.

- Courses that count toward the M.S. degree's core or elective coursework requirement in Biology:
    - BIO420 Developmental Biology (4 undergraduate credits)
    - BIO430 Comparative Physiology (4 undergraduate credits)
- Courses that count toward the M.S. degree's elective coursework requirement in Chemistry:
    - CHE414 Biochemistry (4 undergraduate credits)
- Courses that count toward the M.S. degree's elective coursework requirement in Psychology:
    - PSY402 Social and Affective Neuroscience (3 undergraduate credits)
    - PSY403 Cognitive Neuroscience (3 undergraduate credits)
- *Note*: The Assumption University PHI 262 Biomedical Ethics course may be used to satisfy the Ethics requirement of the M.S. degree in Neuroscience, but it will carry zero credits toward the MS degree.

<u>WPI graduate courses eligible for double-counting toward a Bachelor's degree at Assumption University</u>:

- Assumption University will accept up to two of the WPI graduate courses listed below towards credit for an undergraduate degree at Assumption. A grade of "C" or higher in these two courses is required.
- WPI neuroscience graduate courses:
    - NEU 501 Neuroscience:
        - NEU 501 will satisfy the BIO415 requirement for the Neuroscience Major with a Cellular Path, Neuroscience Major with a Psychology Path, and the Biology Major with a concentration in neuroscience and behavior.
        - NEU 501 will count as a Quantitative elective or Biology elective in the Biology major.
        - However, NEU 501 will not satisfy the 400-level elective requirement at Assumption. For example, the Biology Major with a Concentration in Neuroscience and Behavior and the Neuroscience Major with a Cellular Path must take at least one 400 level biology course with a lab, or CHE414 with a lab, at Assumption University.
- WPI elective graduate courses for the M.S. in Neuroscience:
    - BCB501 Bioinformatics
    - BCB504 Statistical Methods in Genetics and Bioinformatics
    - DS501 Introduction to Data Science

  One of the WPI elective graduate courses listed above will count as a “Biology elective” or “Quantitative Elective” in the following programs at Assumption: Neuroscience Major with a Cellular Path, Biology Major with a Concentration in Neuroscience and Behavior, and Biology Major. For Assumption students pursuing a Neuroscience Major with a Psychology Path, elective graduate courses listed above will count as an “elective”. A second WPI graduate course from this list will count as a general biology elective course at Assumption.

<u>WPI undergraduate courses eligible for double-counting toward a Bachelor's degree at Assumption University</u>:

The undergraduate WPI courses listed below will count towards an undergraduate major (listed below) at Assumption, provided a student earns a letter grade of "C" or higher. WPI undergraduate courses listed below will count as a “Biology Elective” or “Quantitative Elective” in the following programs at Assumption: Neuroscience Major with a Cellular Path, Biology Major

with a Concentration in Neuroscience and Behavior, and Biology Major. For Assumption students pursuing a Neuroscience Major with a Psychology Path, elective undergraduate courses listed below will count as an "elective".

- Bioinformatics and Computational Biology courses:
  - BCB 4001/BB4801. Bioinformatics
  - BCB 4002/CS 4802. Biovisualization
  - BCB 4003/CS 4803. Biological and Biomedical Database Mining
  - BCB 4004/MA 4603. Statistical Methods in Genetics and Bioinformatics
- Biology and Biotechnology courses:
  - BB/CH 4190. Regulation of Gene Expression
  - BB 4260. Synthetic Biology
- Biomedical Engineering courses:
  - BME/ECE 4011. Biomedical Signal Analysis
  - BME 4201. Biomedical Imaging
- Chemistry and Biochemistry courses:
  - CH 4110. Protein Structure and Function
  - CH 4120. Lipids and Biomembrane Functions
  - CH4160. Membrane Biophysics
  - CH4170. Experimental Genetic Engineering
- Computer Science courses:
  - CS 4341. Introduction to Artificial Intelligence
  - CS 4342. Machine Learning
  - CS 4432. Database Systems II
  - CS 4445. Data Mining and Knowledge Discovery in Databases
  - CS 4518. Mobile and Ubiquitous Computing
  - CS 4802/BCB 4002. Biovisualization
  - CS 4803/BCB 4003. Biological and Biomedical Database Mining
- Data Science courses:
  - DS 4635/MA 4635. Data Analytics and Statistical Learning
- Mathematics courses:
  - MA 4631. Probability and Mathematical Statistics I
  - MA 4632. Probability and Mathematical Statistics II
  - MA 4635/DS 4635. Data Analytics and Statistical Learning
- Psychology courses:
  - PSY 4800. Special Topics in Psychological Science
  - PSY 4900. Advanced Research in Psychological Science

3. Plan of Study Form for the Collaborative Accelerated Master's Program in Neuroscience between Assumption University and WPI

The Plan of Study Form is attached at the end of this document.

4. Program Administration

The *WPI Neuroscience-Program Coordinator* for this collaborative accelerated master's program will be Prof. Jagan Srinivasan, who will serve as the point of contact for the M.S. degree program in Neuroscience. He will work in collaboration with the WPI *Collaborative Accelerated Master's*

Programs Framework Coordinator and with the *Assumption University Neuroscience-Program Coordinator*, Prof. Michele Lemons on the academic aspects of this Collaborative Accelerated Master's Program in Neuroscience and on providing academic advice to students in this program.

5. Endorsements
This motion is endorsed by the faculty in the Neuroscience Program at WPI, and by the Neuroscience Program, and the Departments of Biological and Physical Sciences, Psychology, and Mathematics and Computer Sciences at Assumption University.

Rationale:

About Neuroscience:
It is an exciting time to study neuroscience! The brain is the most complex organ in our body and arguably the least understood. Understanding the human brain and peripheral nervous system is one of the most significant scientific challenges of our time. With recent advances in technology, we are poised to better understand the mechanisms of brain development and function. Deciphering interactions between different neural structures links the diverse fields of neuroscience, psychological and cognitive science, cell and molecular biology, computer science, biomedical engineering, mathematics, and physics.

Neuroscience Degree Programs at Assumption University and at WPI:
Assumption University offers B.S. and B.A. degrees and two different concentrations in Neuroscience. Assumption undergraduate students have four possible pathways to study neuroscience: two Neuroscience Majors: one with a Cellular focus (B.S.) and one with a Psychological focus (B.A.); and two Neuroscience Concentrations: one coupled with a Biology major (B.S.) and one coupled with a Psychology major (B.A.).

WPI offers a B.S./M.S. program and an M.S. degree in Neuroscience. The mission of the Neuroscience Program at WPI is to provide an outstanding education to its students and to advance scholarship in the biological, behavioral, and computational aspects of the study of the nervous system and its interaction with the world.

Benefits to Assumption University and to WPI of this Collaborative Accelerated Master's Program in Neuroscience:
Assumption students who pursue neuroscience courses at Assumption can choose to further their understanding of neuroscience by pursuing a master's in Neuroscience at WPI. Assumption students can employ their undergraduate neuroscience education as a springboard to earn an M.S. in Neuroscience at WPI in an accelerated manner. A master's degree will poise these students well for future employment and for entry into Ph.D. programs, M.D. programs, P.T. programs, P.A. programs, and other health professions.

This Collaborative Accelerated Master's Program in Neuroscience benefits WPI by encouraging undergraduate students with undergraduate neuroscience training (and who are familiar with Worcester) to enter into WPI's M.S. in Neuroscience program. Assumption students' interests in neuroscience are strong, and their understanding of neuroscience fundamentals (from both biological and psychological perspectives) will serve as an asset to WPI's graduate program. In addition, many students at Assumption are interested in remaining in the Worcester area and having a local option for a graduate degree can be attractive for these students.

Our partnership between WPI and Assumption has developed productive collaborations. WPI faculty and students have been invited (and have attended) guest research seminars supported

by Assumption's Center for Neuroscience program. Assumption's Center for Neuroscience offers several guest lectures each year, these seminars are offered in-person and via zoom, allowing easy access for colleagues and students at WPI. Similarly, WPI has invited Assumption faculty and students to neuroscience seminars.

Partnerships like this one help highlight graduate options for undergraduate students. As we emerge from the pandemic, students are becoming more open to thinking more broadly about their post-graduate careers and many students are pursuing graduate options. This partnership offers a local Worcester option for neuroscience students to earn a master's degree in Neuroscience at WPI in an accelerated manner.

Design choices of this Collaborative Accelerated Master's Program in Neuroscience:
General design choices are provided in the rationale of the motion that introduces the general Collaborative Accelerated Master's Programs Framework between Assumption University and WPI. Here we provide design choices specific to the Collaborative Accelerated M.S. Program in Neuroscience.

Four credit science courses at Assumption University require students to meet in a classroom 150 minutes per week in addition to meeting in a laboratory for 180 minutes per week, for a full semester. These courses (lecture plus lab) demand considerable work outside of scheduled classroom and laboratory time. In addition, the Assumption University 400-level courses listed in this Collaborative Accelerated M.S. Program in Neuroscience include a semi-independent research project component that lasts several weeks and requires students to conduct more time-demanding and technically-challenging experiments beyond scheduled lab time. Hence, these 4-credit courses will carry 3 graduate credits toward the M.S. degree in Neuroscience at WPI.

This Collaborative Accelerated M.S. program in Neuroscience adds to existing collaborations between Assumption and WPI. In particular, there is an existing articulation agreement that reserves spaces and facilitates the admission of qualified WPI Psychology students into Assumption's competitive and prestigious Clinical Counseling Psychology Master of Arts degree program and Applied Behavior Analysis Master of Arts degree program. Additionally, Assumption Psychology majors present their projects at WPI's Project Presentation Day and vice versa; this creates a natural opportunity for Psychology students to forge and grow connections, and for those among these students who are interested in Neuroscience to be attracted to this new collaborative program.

Impact on Degree Requirements: None.

Resources Needed: None.

Implementation Date: Implementation date for this action is AY2024-2025.

Contacts for this Collaborative Accelerated Master's Program in Neuroscience:

Contacts at WPI:

Collaborative Accelerated M.S. Program in Neuroscience Coordinator at WPI:

- Jagan Srinivasan, Biology and Biotechnology, Neuroscience Program Director

Neuroscience Faculty Steering Committee:

- Robert Dempski, Chemistry and Biochemistry
- Jean King, Biology and Biotechnology and Dean of Arts & Sciences

- Dmitry Korkin, Computer Science
- Adam Lammert, Biomedical Engineering
- Richard Lopez, Social Sciences and Policy Studies (Psychological and Cognitive Science Program)
- Inna Nechipurenko, Biology and Biotechnology
- Benjamin Nephew, Biology and Biotechnology
- Angela Rodriguez, Social Sciences and Policy Studies (Psychological and Cognitive Science Program)
- Carolina Ruiz, Computer Science and Associate Dean of Arts & Sciences
- Suzanne Scarlata, Chemistry and Biochemistry
- Jeanine Skorinko, Social Sciences and Policy Studies (Psychological and Cognitive Science Program)
- Erin Solovey, Computer Science
- Jagan Srinivasan, Biology and Biotechnology
- Ali Yousefi, Computer Science

Contacts at Assumption University:

Collaborative Accelerated M.S. Program in Neuroscience Coordinator at Assumption University:

- Michele Lemons, Biology and Director of Center for Neuroscience
  Other Faculty, Staff, and Administrators at Assumption University*:*

  - Michelle Graveline, Interim Dean of the D'Amour College of Liberal Arts and Sciences
  - Brian Niece, Chairperson of Biological and Physical Sciences
  - Stuart Cromarty, Biology
  - Nikos Lessios, Biology
  - Anthony Saccino, Biology
  - Lea Gordon, Chairperson of Psychology
  - Jessica McCready, Chairperson of *Mathematics and Computer* Science

Collaborative Accelerated M.S. Program in Neuroscience
Plan of Study

See the WPI Graduate Catalog and the Neuroscience webpages for additional information about the Neuroscience MS degree requirements.

Student: _____

Assumption ID#: _____

WPI ID#: _____

Email Address: _____

Bachelor's Degree: _____

Entry Date: _____

Expect. MS Completion Date: _____

WPI Academic Advisor: _____

☐ **General Collaborative Accelerated Master's Programs Framework Requirements:**

- ☐ The equivalent of at most 12 graduate credits can be double-counted toward the bachelor's and M.S. degrees.
- ☐ Within this 12-graduate credit maximum, eligible senior-level Assumption and 4000-level WPI undergraduate courses (listed below) count toward the M.S. degree in Neuroscience only if:
  - ☐ They are taken before students graduate with their bachelor's degree.
  - ☐ The course grade is a "B-" or higher.
  - ☐ At most 2 eligible Assumption undergraduate courses can be counted.
- ☐ Restricted course combinations are provided in a table at the end of this document.

☐ **Core Neuroscience Coursework Requirement:** at least 19 graduate credits.

☐ **Neuroscience courses:** at least 9 graduate credits from the list of Eligible Neuroscience Courses

School	Course #	Course Title	Semester	Grad credits	Grade	Double-counted?

☐ **Biology course(s):** at least 3 graduate credits from the list of Eligible Biology & Biotechnology Courses

School	Course #	Course Title	Semester	Grad credits	Grade	Double-counted?

☐ **Computer Science course(s):** at least 3 graduate credits from the list of Eligible Computer Science Courses

School	Course #	Course Title	Semester	Grad credits	Grade	Double-counted?

☐ **Bioethics course:** at least 1 graduate credit. *For example, BB 551 Research Integrity in the Sciences or ID 500 Responsible Conduct of Research. Assumption's PHI 262 Biomedical Ethics course may be used to satisfy the Ethics requirement of the M.S. degree in Neuroscience, but it will carry 0 credits toward the MS degree.*

School	Course #	Course Title	Semester	Grad credits	Grade	Double-counted?

☐ **Scientific Writing or Experimental Design course:** at least 3 graduate credits. *For example, BB 553 Experimental Design and Statistics in the Life Sciences, MA 546 Design and Analysis of Experiments or ID 527 Fundamentals of Scientific Teaching and Pedagogy.*

School	Course #	Course Title	Semester	Grad credits	Grade	Double-counted?

☐ **MS Thesis (optional):** 9 graduate credits. Conducted at WPI.
The thesis must be advised or co-advised by a faculty member affiliated with the WPI Neuroscience Program.

☐ MS thesis proposal.
*Must be submitted to and approved by the Neuroscience Faculty Steering Committee **before the student receives grades for more than 3 MS thesis credits**. Normally students submit thesis proposals during their 2nd or 3rd semester.*

☐ MS thesis reader assigned.
MS thesis reader will be assigned by the Neuroscience Program Director when the MS thesis proposal is approved. The reader must be a Neuroscience-affiliated faculty in a department different from that(those) of the thesis advisor(s).
Reader's Name: _____

☐ 9 MS thesis credits NEU599. *Only 9 MS thesis credits may be applied towards the MS degree.*

Course #	Course Title	Semester	Credits	Grade
NEU 599	Master's Thesis			
NEU 599	Master's Thesis			
NEU 599	Master's Thesis			
NEU 599	Master's Thesis			

☐ Public Thesis presentation to the WPI Neuroscience Faculty.

☐ Final thesis approval. *Title page signed by advisor(s), reader, and Neuroscience program director.*

☐ **Research or practice-oriented internship (optional):** 3 graduate credits. Conducted at WPI.
The internship is to be 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 Neuroscience program.

Course #	Sponsoring organization / research lab	Semester	Credits	Grade

☐ **Program electives to satisfy the remainder of the 31-credit requirement** from any of the lists of Eligible Courses
If the research or practice-oriented internship option is used, this list of electives must include a Neuroscience course (3 grad credits) in addition to the 3 Neuroscience courses (9 graduate credits) in the Core Neuroscience Coursework Requirement.

School	Course #	Course Title	Semester	Grad credits	Grade	Double-counted?

Student's Signature and Date: _____

WPI Advisor Signature and Date: _____

Assumption Advisor Signature and Date: _____

WPI Neuroscience Program Director Signature and Date: _____

LISTS OF ELIGIBLE COURSES

For courses marked with (‡), (*) or (**), please see Notes at the end of this section.

Eligible <u>Neuroscience</u> courses:

WPI Graduate Courses (3 graduate credits each):
- NEU 501 Neuroscience (‡)
- NEU 502 Neural Plasticity
- NEU 503 Computational Neuroscience
- NEU 504 Advanced Psychophysiology
- NEU 505 Brain-Computer Interaction

Assumption Undergraduate Courses:
- BIO415 Principles of Neuroscience (3 graduate credits)
  - Students can receive credit towards their M.S. degree for BIO415 or for NEU501, but not for both.
- BIO490 Independent Study with Neuroscience Focus (2 graduate credits)
  - This ISC may be conducted with Assumption University and/or WPI faculty.

Eligible <u>Bioinformatics and Computational Biology</u> courses:

WPI Graduate Courses (3 graduate credits each):
- BCB 501/BBT 581 Bioinformatics (*)
- BCB 502/CS 582 Bio visualization
- BCB 503/CS 583 Biological and Biomedical Database Mining
- BCB 504/MA 584 Statistical Methods in Genetics and Bioinformatics (*)
- BCB 510 Bioinformatics and Computational Biology Seminar

WPI Undergraduate Courses (2 graduate credits each):
- BCB 4001/BB4801. Bioinformatics (**)
- BCB 4002/CS 4802. Biovisualization (**)
- BCB 4003/CS 4803. Biological and Biomedical Database Mining (**)
- BCB 4004/MA 4603. Statistical Methods in Genetics and Bioinformatics (**)

Eligible <u>Biology and Biotechnology</u> courses:

WPI Graduate Courses (3 graduate credits each):
- BBT 561 Model Systems: Experimental Approaches and Applications
- BBT 581/ BCB 501 Bioinformatics

WPI Undergraduate Courses (2 graduate credits each):
- BB/CH 4190. Regulation of Gene Expression (**)
- BB 4260. Synthetic Biology (**)

Assumption Undergraduate Courses:
- BIO420 Developmental Biology (3 graduate credits)
- BIO430 Comparative Physiology (3 graduate credits)

Eligible <u>Biomedical Engineering</u> courses:

WPI Graduate Courses (3 graduate credits each):
- BME 550 Tissue Engineering
- BME 555 BioMEMS and Tissue Micro engineering

BME 560 Physiology for Engineers
BME 583 Biomedical Microscopy and Quantitative Imaging

WPI Undergraduate Courses (2 graduate credits each):
BME/ECE 4011. Biomedical Signal Analysis (**)
BME 4201. Biomedical Imaging (**)

Eligible Chemistry and Biochemistry courses:

WPI Graduate Courses (3 graduate credits each):
CH 520 Cell Signaling
CH 538 Medicinal Chemistry
CH 541 Membrane Biophysics
CH 555D Drug and Regulations
CH 555R Drug Safety and Regulatory Compliance
CH 555/PH597 Cell Mechanics

WPI Undergraduate Courses (2 graduate credits each):
CH 4110. Protein Structure and Function (**)
CH 4120. Lipids and Biomembrane Functions (**)
CH 4160. Membrane Biophysics (**)
CH 4170. Experimental Genetic Engineering (**)

Assumption Undergraduate Courses:
CHE414 Biochemistry (3 graduate credits)

Eligible Computer Science courses:

WPI Graduate Courses (3 graduate credits each):
CS 5007 Introduction to Applications of Computer Science with Data Structures and Algorithms
CS 5084 Introduction to Algorithms: Design and Analysis
CS 528 Mobile and Ubiquitous Computing
CS 534 Artificial Intelligence
CS 539 Machine Learning
CS 541/DS 541 Deep Learning
CS 542 Database Management Systems
CS 546 Human-Computer Interaction
CS 548 Knowledge Discovery and Data Mining
CS/RBE 549 Computer Vision
CS/SEME 565 User Modeling
CS/SEME 566 Graphical Models for Reasoning under Uncertainty
CS/SEME 567 Empirical Methods for Human-Centered Computing
CS 573 Data Visualization
CS 584 Algorithms: Design and Analysis
CS 585/DS 503 Big Data Management
CS 586/DS 504 Big data Analytics

WPI Undergraduate Courses (2 graduate credits each):
CS 4341. Introduction to Artificial Intelligence (**)
CS 4342. Machine Learning (**)
CS 4432. Database Systems II (**)
CS 4445. Data Mining and Knowledge Discovery in Databases (**)
CS 4518. Mobile and Ubiquitous Computing (**)
CS 4802/BCB 4002. Biovisualization (**)
CS 4803/BCB 4003. Biological and Biomedical Database Mining (**)

Eligible Data Science courses:

WPI Graduate Courses (3 graduate credits each):

DS 501 Introduction to Data Science (*)
DS 502/MA 543 Statistical Methods for Data Science

WPI Undergraduate Courses (2 graduate credits each):

DS 4635/MA 4635. Data Analytics and Statistical Learning (**)

Eligible Mathematical Sciences courses:

WPI Graduate Courses (3 graduate credits each):

MA 508 Mathematical Modeling
MA 543/DS 502 Statistical Methods for Data Science
MA 510/CS 522 Numerical Methods
MA 511 Applied Statistics for Engineering and Scientists
MA 542 Regression Analysis
MA 546 Design and Analysis of Experiments
MA 550 Time Series Analysis
MA 556 Applied Bayesian Statistics

WPI Undergraduate Courses (2 graduate credits each):

MA 4631. Probability and Mathematical Statistics I (**)
MA 4632. Probability and Mathematical Statistics II (**)
MA 4635/DS 4635. Data Analytics and Statistical Learning (**)

Eligible Psychology courses:

WPI Undergraduate Courses (2 graduate credits each):

PSY 4800. Special Topics in Psychological Science (**)
PSY 4900. Advanced Research in Psychological Science (**)

Assumption Undergraduate Courses:

PSY402 Social and Affective Neuroscience (2 graduate credits)
PSY403 Cognitive Neuroscience (2 graduate credits)

NOTES:

- Other graduate courses, graduate research credits, or Independent Study Grad Courses (ISGs) may be used to satisfy Neuroscience MS degree requirements with prior approval of the WPI Neuroscience Director.
- Courses marked with (‡): At Assumption University:
  - NEU 501 will satisfy the BIO415 requirement for the Neuroscience Major with a Cellular Path, Neuroscience Major with a Psychology Path, and the Biology Major with a concentration in neuroscience and behavior.
  - NEU 501 will count as a Quantitative elective or Biology elective in the Biology major.
  - However, NEU 501 will not satisfy the 400-level elective requirement at Assumption. For example, the Biology Major with a Concentration in Neuroscience and Behavior and the Neuroscience Major with a Cellular Path must take at least one 400 level biology course with a lab, or CHE414 with a lab, at Assumption University.
- Courses marked with (*): At Assumption University, one of the WPI elective graduate courses marked with (*) above will count as a "Biology elective" or "Quantitative Elective" in the following programs at Assumption: Neuroscience Major with a Cellular Path, Biology Major with a Concentration in Neuroscience and Behavior, and Biology Major. For Assumption students pursuing a Neuroscience Major with a Psychology Path, elective

graduate courses marked with (*) above will count as an “elective”. A second WPI graduate course marked with (*) will count as a general biology elective course at Assumption.

- Courses marked with (**): At Assumption University, the undergraduate WPI courses marked with (**) above will count towards an undergraduate major (listed below) at Assumption, provided a student earns a letter grade of "C" or higher. WPI undergraduate courses marked with (**) will count as a “Biology Elective” or “Quantitative Elective” in the following programs at Assumption: Neuroscience Major with a Cellular Path, Biology Major with a Concentration in Neuroscience and Behavior, and Biology Major. For Assumption students pursuing a Neuroscience Major with a Psychology Path, elective undergraduate courses marked with (**) will count as an “elective”.

Restricted Course Combinations:

The following table lists courses that have significant overlap in their content; a student may receive credit towards their M.S. degree in Neuroscience at WPI for at most one of the courses in each row below:

Courses from Assumption University and WPI	
Assumption Course	**WPI Course**
BIO 415 Principles of Neuroscience	NEU 501 Neuroscience
WPI Courses in Bioinformatics and Computational Biology	
Undergraduate Course	**Graduate Course**
BCB 4001/BB4801. Bioinformatics	BCB 501/BBT 581 Bioinformatics
BCB 4002/CS 4802. Biovisualization	BCB 502/CS 582 Biovisualization
BCB 4004/MA 4603. Statistical Methods in Genetics and Bioinformatics	BCB 504/MA 584 Statistical Methods in Genetics and Bioinformatics
WPI Courses in Computer Science	
Undergraduate Course	**Graduate Course**
CS 4341 Introduction to Artificial Intelligence	CS 534 Artificial Intelligence
CS 4342 Machine Learning	CS 539 Machine Learning
CS 4432 Database Systems II	CS 542 Database Management Systems
CS 4518 Mobile and Ubiquitous Computing	CS 528 Mobile and Ubiquitous Computing
WPI Courses in Mathematics and Data Science	
Undergraduate Course	**Graduate Course**
MA 4631 Probability and Mathematical Statistics I	MA 540 Probability and Mathematical Statistics I
MA 4632 Probability and Mathematical Statistics II	MA 541 Probability and Mathematical Statistics II
DS 4635/MA 4635 Data Analytics and Statistical Learning	MA 543/DS 502 Statistical Methods for Data Science

Date: February 14, 2024
To: WPI Faculty
From: Committee on Appointments and Promotions (Prof. Martin and Prof. Weathers, Co-Chairs)
Committee on Governance (Prof. Heineman, Chair)
Re: Motion to make minor modifications to the language describing materials collected by Joint Promotion Committees

Motion: The Committee on Appointments and Promotions (COAP) and the Committee on Governance (COG) recommend, and we move that the language describing the materials collected by Joint Promotion Committees for candidates for promotion to full Professor, full Professor of Teaching, full Teaching Professor, and Associate Teaching Professor (in the Faculty Handbook, Chapter Four, Section 3.a.iv) be slightly modified, as described below.

Description of the Motion:
The current Faculty Handbook articulates that, in addition to the materials submitted by the candidate for promotion (to full Professor, full Professor of Teaching, full Teaching Professor, and Associate Teaching Professor), the Joint Promotion Committee will add other sources of information to the complete promotion review dossier. The description of this additional information needs to be updated because with the changes in institutional systems (e.g., Banner to Workday), some information may no longer be available in the same capacity.

Proposed modifications: Faculty Handbook, Chapter Four, Section 3.a.iv
(Text to be removed is ~~struck-out~~. Text to be added is highlighted in yellow.)

3. PROMOTION PROCEDURES: to (full) Professor; (full) Professor of Teaching; (full) Teaching Professor; and Associate Teaching Professor

iv. Summary of Materials Collected by The Joint Promotion Committee:
In all promotion cases covered in this Section 3, during the summer before the academic year of the promotion review, in addition to the materials submitted by the candidate, the Joint Promotion Committee will add four other sources of information to the complete promotion review dossier:

1) Summary student ratings for all courses and projects taught at WPI in the last five years.
2) Responses to a teaching evaluation sent to a random selection of former students and alumni whom the candidate has taught in the last five years.
3) Instructional Activity ~~Reports~~ data for the last five years when available.
4) Letters of appraisal solicited by the committee from Professional Associates identified by the candidate, each for an independent confidential evaluation of the materials submitted by the candidate for the promotion dossier (see Section 3.b.i below).

In cases of promotion to (full) Professor and (full) Professor of Teaching, the Joint Promotion Committee will add a fifth source of information:

5) Letters of appraisal solicited by the Joint Promotion Committee from External Reviewers identified by the Nominator and the Advocate on the Joint Promotion Committee, each for an independent confidential evaluation of the materials submitted by the candidate for the promotion dossier (see Section 3.b.i below).

~~In~~ Solely for cases of promotion to (full) Professor, ~~only,~~ the Joint Promotion Committee will add a sixth source of information:

6) Sponsored ~~R~~research ~~A~~activity ~~Reports~~ data for the last five years when available.

The Joint Promotion Committee also collects other materials in the summer or the fall, as necessary, to arrive at a fair and equitable evaluation of the candidate.

Rationale:

COAP and COG would like to update the description of the sources of information that the Faculty Handbook says that the Joint Promotion Committees will add because with the changes in institutional systems (e.g., Banner to Workday) some information may no longer be available or available in the same capacity. In particular, access to Instructor Activity Reports and Sponsored Research Activity Reports has changed. Therefore, we have updated the language to allow for access to instructor activity data and sponsored research activity more generally—things that may be generally accessible in Workday.

Note: This motion is for discussion only at the Feb. 14, 2024 meeting.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Appointments and Promotions (Prof. Martin and Prof. Weathers, Co-Chairs)
Committee on Governance (Prof. Heineman, Chair)
Re: Motion to add guidance for candidates for promotion to (full) Teaching Professor and Associate Teaching Professor in preparation of the promotion dossier

Motion: The Committee on Appointments and Promotions (COAP) and the Committee on Governance (COG) recommend, and we move that the language describing the promotion dossier (in the Faculty Handbook, Chapter Four, Section 3.b) be modified to add guidance for candidates for promotion to (full) Teaching Professor and Associate Teaching Professor in preparation of the promotion dossier, and to include page limits for the candidates' personal and reflective statements, as described below.

Description of the Motion:
The current Faculty Handbook provides a general description of the promotion dossier for candidates for promotion to (full) Professor; (full) Professor of Teaching; (full) Teaching Professor; and Associate Teaching Professor. However, it only provides explicit guidance for candidates for (full) Professor and (full) Professor of Teaching. This motion would address that deficiency by adding information specifically for candidates for promotion to both (full) Teaching Professor or Associate Teaching Professor.

Proposed modifications: Faculty Handbook, Chapter Four, Section 3.b
(Text to be removed is ~~struck out~~. Text to be added is highlighted in yellow.)

3. PROMOTION PROCEDURES: to (full) Professor; (full) Professor of Teaching; (full) Teaching Professor; and Associate Teaching Professor

b. The Promotion Dossier: Documentation and Evaluation

i. Documentation Submitted by the Candidate:
(Approved by the faculty, May 10, 2022)

Candidates for promotion to (full) Professor, (full) Professor of Teaching, Associate Teaching Professor, and (full) Teaching Professor will submit a promotion dossier representative of their overall career. For promotion to (full) Professor, (full) Professor of Teaching, or (full) Teaching Professor, the emphasis will be on work since tenure and/or promotion to the associate rank in the appropriate track. Overall, all candidates included in this Section 3 should use this documentation to present the case that they have achieved the criteria for promotion. All candidates are invited and encouraged to use the promotion dossier to make arguments for the quality and impact of their work using the categories appropriate to their promotion criteria or in other ways if those other ways are appropriate to the form and impact of their contributions.

The candidate's promotion dossier will include the following: a **curriculum vitae (CV)**; a **personal statement**; a **teaching portfolio**; relevant **sample artifacts** and other indicators to demonstrate the high quality and external impact of the candidate's contributions:.

The **CV** provides comprehensive documentation of the candidate's professional experience and accomplishments.

- For promotion to full Professor, the emphasis is on accomplishments in teaching, scholarship/creativity, and service.

- For promotion to full Professor of Teaching, the emphasis is on accomplishments in teaching practice, continuing professional growth and currency, and service.
- For promotion to Associate Teaching Professor, the emphasis is on accomplishments in teaching and service.
- For promotion to (full) Teaching Professor, the emphasis is on accomplishments in teaching, professional growth, leadership, and service.

The **personal statement** provides a reflective summary and description of the candidate's professional accomplishments and contributions.

- For promotion to full Professor, the personal statement (10 pages maximum) includes a reflective summary and description of the candidate's scholarly contributions, and it typically will include sections on teaching, scholarship/creativity, service, external impact, and future plans.
- For promotion to full Professor of Teaching, the personal statement (10 pages maximum) includes a reflective summary and typically will include sections on teaching practice, professional growth and currency, service, external impact, and future plans. The statement should provide a narrative arc that helps the committee and the Provost understand the candidate's activities to date, how those activities benefit the candidate and enhance WPI's educational mission and visibility, and how they will lead to the next stage of the candidate's career.
- For promotion to Associate Teaching Professor, the personal statement (5 pages maximum) includes a reflective statement and description of the candidate's contributions to teaching, and it typically includes sections on teaching, service, and future plans.
- For promotion to (full) Teaching Professor, the personal statement (10 pages maximum) includes a reflective statement and description of the candidate's contributions to teaching with a focus on professional growth and leadership, and it typically includes sections on teaching, professional growth, leadership, service, and future plans.

The **teaching portfolio** provides documentation of the candidate's teaching. The teaching portfolio presents representative teaching materials and evidence of their effectiveness. Typical elements in a teaching portfolio include a reflective statement of the candidate's approach to teaching and learning (4-6 pages maximum), samples of teaching materials and teaching innovations, and measures of teaching effectiveness or materials that demonstrate student learning. The teaching portfolio should not exceed 50 pages (including the 4-6 pages of the reflective statement).

- For promotion to full Professor, the **teaching portfolio** provides documentation of the candidate's high quality teaching.
- For promotion to full Professor of Teaching, the **teaching portfolio** provides documentation of the candidate's high-quality teaching practice with significant impact.
- For promotion to Associate Teaching Professor, the teaching portfolio provides documentation of the candidate's high-quality teaching.
- For promotion to full Teaching Professor, the teaching portfolio provides documentation of the candidate's *high-quality teaching practice, professional growth and leadership in teaching.*

The **sample artifacts** provide documentation of the high quality and external impact of the candidate's contributions.

- For promotion to full Professor, the **sample scholarly artifacts** provide documentation of the high quality and external impact of the candidate's scholarly contributions. The choice of artifacts should reflect the standard of the discipline and not exceed three examples that have been published during the period of their current rank. Scholarly contributions may be documented and disseminated through a variety of peer-reviewed or other discipline specific critically reviewed artifacts. ~~For most candidates, the sample scholarly artifacts will be three peer-reviewed articles that have been published since tenure and/or promotion. However, scholarly contributions may be documented and disseminated through a variety of artifacts besides peer-reviewed articles. The continuum of artifacts through which knowledge may be documented and disseminated matches, in its inclusiveness and variety, the continuum of scholarship.~~ Sample scholarly artifacts must be publicly available, amenable to critical appraisal, and in a form that permits exchange and use by other members of the scholarly community.
- For promotion to full Professor of Teaching, the **sample artifacts** provide documentation of the high-quality and external impact of the candidate's contributions to teaching practice and their commitment to and successes in professional growth and currency especially as those successes demonstrate innovative teaching and creative pedagogical development, exploration, and experimentation within and/or beyond the context of their discipline. Contributions may be documented and disseminated through a variety of artifacts. The continuum of artifacts through which successful contributions may be documented and disseminated matches, in its inclusiveness and variety, the continuum of ways one may demonstrate impact and quality of teaching practice and impact and commitment to professional growth and currency.
- For promotion to Associate Teaching Professor or (full) Teaching Professor, sample scholarly artifacts that the candidate has shown provide evidence of excellence of teaching are welcomed but not required.

Candidates for promotion to full Professor must submit a **citation index and any other indicators of external impact** appropriate to their scholarly contributions. The citation index should include all citations of the candidate's publications, presentations or other scholarly contributions. Additional indictors of external impact might include reviews of the candidate's work, press and media coverage, downloads of scholarly materials, awards and recognition, or any other indicators that the candidate's scholarly contributions have had an impact beyond WPI.

Scholarly contributions made by candidates for promotion to full Professor may combine or cut across traditional categories of teaching, scholarship/creativity and service.

Professional contributions made by candidates for promotion to full Professor of Teaching may combine or cut across traditional categories of teaching practice, continuing professional growth and currency, and service.

All candidates are welcome to submit any metric of external impact they wish so long as the context is explained.

ii. *Standards for Evaluation:*

Joint Promotion Committee members, the Provost, and peer reviewers should provide their independent assessments of the candidate's professional activities with respect to quality, impact, and commitment, as appropriate to the rank and track of the candidate. This section provides guidance that will be shared with all those involved in these assessments.

An assessment of the candidate's professional activities may be based on any and all material in the promotion dossier. Traditional measures to assess quality do not necessarily accommodate all areas of professional activity. Nonetheless, the following six standards have been identified to evaluate quality across diverse areas: clear goals, adequate preparation, appropriate methods, significant results, effective presentation, and reflective critique (Glassick, Huber, and Maeroff, *Scholarship Assessed*, 1997). Since the dossier includes the candidate's reflective critique in their personal statement, all reviewers are invited to apply these six standards to assess the candidate's professional activities described in the promotion portfolio.

- For promotion to (full) Professor, the focus should be on an assessment of **high quality teaching, high quality scholarship/creativity, and service** to WPI, the field/professional, or community outside of WPI. The assessment may be based on any and all material in the promotion dossier, including the CV, personal statement, teaching portfolio, peer-reviewed scholarship, peer reviews of sample scholarly artifacts, or indicators of external impact, and indicators of service.

- For promotion to (full) Professor of Teaching, the focus should be on an assessment of **high-quality teaching practice with significant impact, commitment to and significant impact of professional growth and currency, and service** to WPI, the field/professional, or community outside of WPI. The assessment may be based on any and all material in the promotion dossier, including the CV, personal statement, teaching portfolio, sample artifacts, or indicators of external impact, and indicators of service.

- For promotion to Associate Teaching Professor, the focus should be on an assessment of **high-quality teaching and service** to WPI, the field/professional, or community outside of WPI. The assessment may be based on any and all material in the promotion dossier, including the CV, personal statement, teaching portfolio, and indicators of service.

- For promotion to full Teaching Professor, the focus should be on an assessment of **high-quality teaching, professional growth, leadership, and service** to WPI, the field/professional, or community outside of WPI. The assessment may be based on any and all material in the promotion dossier, including the CV, personal statement, teaching portfolio, and indicators of service.

External impact beyond WPI, when relevant to the criteria for the particular promotion, should be assessed based on the relevant standards in the areas of the candidate's contributions. Thus, the starting point to assess external impact is the candidate's personal statement.

- For promotion to (full) Professor, the personal statement should identify the area or areas of the candidate's scholarly contributions across teaching, scholarship and service and indicate examples of external impact beyond WPI. Evidence of external impact beyond WPI might include: funding from multiple sources; peer-reviewed articles or presentations in well-regarded journals or conferences; books; reviews, citations or impact factors; downloadable curriculum; patents; films, broadcasts, software, or computer games; discussion of research in legal cases, policy reports, or the media; keynote addresses; workshops for other institutions, regional, national or international

societies; artistic exhibitions, performances or productions; K-12 outreach and educational programs; journal editorships; leadership of academic programs or centers; or impact on external communities through teaching, scholarship or service.

- For promotion to (full) Professor of Teaching, the personal statement should identify the area or areas of their contributions across teaching practice, professional growth and currency, and service and indicate examples of external impact beyond WPI.
- In all cases, while quantitative measures will remain important indicators of quality and impact, WPI recognizes that the weight assigned to quantitative measures and documented evidence of impact varies widely between academic fields as well as along the continuum of contributions and accomplishments of candidates. Consequently, candidates are not limited in the relevant evidence they may provide to demonstrate external impact.

Rationale:
The current Faculty Handbook provides a general description of the promotion dossier for candidates for promotion to (full) Professor; (full) Professor of Teaching; (full) Teaching Professor; and Associate Teaching Professor. However, the language regarding the promotion dossier includes specific detailed information for those seeking promotion to full Professor or full Professor of Teaching. This proposal will ensure that the Faculty Handbook clearly articulates what is expected in the promotion dossier and evaluation in all four cases, including promotion to Associate Teaching Professor and full Teaching Professor.

In addition, the proposal includes minor modification/additions clarifying page limits for the personal statement and the reflective statement in the teaching portfolio for all candidates.

Note: This motion is for discussion only at the Feb. 14, 2024 meeting.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Appointments and Promotions (Prof. Martin and Prof. Weathers, Co-Chairs)
Committee on Governance (Prof. Heineman, Chair)
Re: Motion to include interim department heads in Department Head Evaluations and to modify the manner in which the questionnaire is distributed

Motion: The Committee on Appointments and Promotions (COAP) and the Committee on Governance (COG) recommend, and we move that the language describing "Performance Evaluations of Department Heads" (in the Faculty Handbook, Chapter Two, Section 5.c, Sub-sections.ii and iii) be modified to include interim department heads who are in their second year and to update the description of the manner in which the questionnaire is distributed, as described below.

Description of the Motion:
This motion would update the process described in the Faculty Handbook for "Performance Evaluations of Department Heads" to include interim department heads who are in their second year and to update the description of the manner in which the questionnaire is distributed to reflect current practice.

Proposed modifications: Faculty Handbook, Chapter Two, Section 5.c, Sub-sections.ii and iii
(Text to be removed is ~~struck out~~. Text to be added is highlighted in yellow.)

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

c. Performance Evaluations of Department Heads:

i. *Purpose and Responsibility*: Performance evaluations are made of each Department Head in order to determine if the department is accomplishing its goals in an effective, efficient and harmonious way. The Dean has the responsibility for conducting these evaluations and for reporting back to the Department Head being evaluated.

ii. *Schedule of Evaluations:* Performance evaluations for each Department Head are conducted during the spring of both the second and fourth year of the first five-year appointment~~.~~, during the spring of only ~~In~~ the second year of the second five-year appointment, ~~evaluations will be conducted only in the second year of the appointment~~ and during the spring of the second year of any interim appointment. In addition, the Dean, the Committee on Appointments and Promotions, or the Department Head may request an evaluation at any time. A list of the regular schedule for Department Head evaluations is maintained by the Committee on Appointments and Promotions.

iii. *Evaluation Process:* ~~In the first phase of the evaluation, the Dean~~ The Committee on Appointments and Promotions will work with the Faculty Governance Office to distribute a confidential and anonymous questionnaire to all faculty members in the department. The Committee on Appointments and Promotions has the responsibility for preparing and updating the questionnaire, as appropriate. ~~The department faculty members send their anonymous completed questionnaires to the Faculty Governance Office, where the responses will be confidentially collated and forwarded without attribution to the Dean and to the Committee on Appointments and Promotions.~~ Only the Dean, the Provost, and the Committee on Appointments and Promotions will review the responses.

If either the Committee on Appointments and Promotions, the Dean, or the Provost decides that

additional information is needed, then ~~the~~ COAP will make arrangements for its members to meet with each faculty member in the department concerned. The purpose of these individual meetings is to gain a better understanding of any problem that may have been brought out in the questionnaire. Complete confidentiality will be maintained by the Committee concerning the views of individuals.

The Committee on Appointments and Promotions will discuss all of the information obtained and will prepare a summary describing the perceived strengths and weaknesses of the Department Head being evaluated. ~~The~~ COAP will send the summary letter to the Dean who, after reviewing the contents, will meet with the COAP to discuss the case. Only the Dean, Provost and the President may read the COAP letter.

Whereas collaboration is essential to WPI, Deans are expected to collaborate with other Deans when evaluating Department Heads in departments where collaboration across schools is significant (as defined by the Provost).

The Dean will then meet with the Department Head to discuss the evaluation and also send a letter to the Department Head that summarizes the performance evaluation. A copy of that letter will be sent to the Chair of the Committee on Appointments and Promotions.

Rationale:

For reviewing interim department heads in their second year:
(Changes to Section 5.c, Sub-section.ii)
In the last three years, COAP has seen more interim department heads serving beyond a one-year interim term. Without the proposed change in language, it is unclear if an interim department head in year two should be reviewed. To make the process consistent regardless of title, COAP would like to conduct performance reviews for any department head who serves in the role beyond one year. Moreover, the result of such a second year review might well be useful in assessing the interim department head's qualifications to serve as the permanent department head.

For updating the description of the manner in which the questionnaire is distributed:
(Changes to Section 5.c, Sub-section.iii)
Although the current language in the Faculty Handbook articulates that the Dean's office distributes the department head review questionnaire, in practice, it is the Faculty Governance Office that actually distributes the questionnaire. In addition, the current language in the Faculty Handbook reflects a procedure for paper and pencil reviews. However, the reviews are now conducted electronically, and the proposed updates reflect this practice.

Appendix
Consent Agenda Motions

(see next page)

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add MU 1000 Music and Its Makers

Motion: On behalf of the Department of Humanities and Arts, the Committee on Academic Operations (CAO) recommends, and I move that the MU 1000 Music and Its Makers , as described below, be added.

Proposed Course Description:

MU 1000: Music and Its Makers *(1/3 unit; Cat. I)*
This course will introduce students to interdisciplinary music studies by focusing on the people who create musical meaning: performers, composers, listeners, patrons, writers, and more. As we analyze significant musical works, we will also learn about the broader cultural, historical, and social contexts in which they appeared, and the people involved in their creation – including women and people of color, who are often minimized in discussions of music history. Historical examples will be juxtaposed with contemporary musical works from an array of genres, allowing students to compare today's musical cultures to past ones. Students will also analyze the role of music in their own lives.

Recommended background: No prerequisites. A basic reading knowledge of music is helpful, but not required.

Rationale:
The need for the new course arises from the removal of existing introductory courses MU 1511 and MU 1611 from the curriculum. As a newly designed introductory course, Music and Its Makers will be interdisciplinary and historical in scope, supplementing other introductory courses focused on music theory and aural skills. The advantages of adding this new course include broadening the curricular entry points available to students interested in music, as well as making the music curriculum more diverse and inclusive. As a 1000-level course focused on the historical and cultural analysis of music, the course will provide a strong foundation for a variety of 2000- and 3000-level courses, including MU 2720/2721 (Music History I and II), MU 2719 (Jazz History), MU 2722 (History of American Popular Music), MU 3501 (Music in Time of Conflict), MU 3001 (World Music), and HU 3900 (Music and Society). It will also provide crucial context for performers, composers, and students enrolled in music ensembles who wish to develop a stronger knowledge of music's cultural and historical dimensions.

Impacts on students: The new course will impact current and future students by providing instruction in how to study music from an interdisciplinary and historically informed perspective. Students will develop knowledge of a broad musical repertory; learn how to analyze music and the act of "musicking" in relation to its cultural and historical context; and build a vocabulary for analyzing musical texts. Students will also develop broadly applicable skills in the analysis of cultural texts and in writing: the course pack will include primary source materials such as musical scores, reviews, and photographs, while assignments will include brief essays and other writing-based activities. These skills will benefit students throughout their HUA coursework, regardless of which breadth/depth they ultimately choose.

The expected enrollment of this course is 25 students per section. It is anticipated that there will be four sections offered per year, reaching 100 students in total.

Resources Needed: No new resources are required. Professor Caplan, a new faculty member this year, will lead the design of the course. No laboratory or special information technology is required. No additional library support or resources are needed; all required readings will be provided to students in a course pack. The course could be taught by all faculty who currently teach the introductory courses MU 1511 and MU 1611 (which are being removed from the curriculum). It could also be taught by faculty who currently teach music history courses including MU 2720/2721 (Music History I and II), MU 2719 (Jazz History), MU 2722 (History of American Popular Music), MU 203x (Music in Time of Conflict), MU 3001 (World Music), and HU 3900 (Music and Society).

Implementation Date: The new course is expected to be implemented starting from the 2024-2025 academic year.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add MU 1100 Foundations of Music Theory and Aural Skills

Motion: On behalf of the Music Division / Humanities and Arts Department, the Committee on Academic Operations (CAO) recommends, and I move that MU 1100 Foundations of Music Theory and Aural Skills, as described below, be added.

Proposed Course Description:

MU 1100 Foundations of Music Theory and Aural Skills *(1/3 unit; Cat. I)*
This course introduces basic music theory concepts and helps students develop aural skills. Course topics include scales, intervals, chords, harmonic progressions, and rhythm. Activities include both written work in music notation and ear training exercises.

Recommended Background: some basic knowledge of reading music

Rationale:
The need for the new course arises from the removal of MU1511, MU1611, and MU2611 from the course catalog. The new course will contain much of the content that was repeated in these previous courses, though now present the material in a single location.

Impacts on students: The new course will impact current and future students by aiming to better meet the experience of the majority of incoming students. The course learning outcomes have been set up to help students succeed in currently offered 2000 and 3000-level theory based music courses (such as MU2723 – Music Composition, MU3002 – Arranging and Orchestration, and MU3730 – Jazz Theory).

Resources Needed: Since this course replaces numerous sections of MU1511, MU1611, and MU2611, no new resources are required

Implementation Date: The new course is expected to be implemented starting from the 2024-25 Academic Year

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add MU 2501 Conducting

Motion: On behalf of the Humanities and Arts Department, the Committee on Academic Operations (CAO) recommends, and I move that the following course MU 2501 Conducting, as described below, be added.

Proposed Course Description:

MU 2501: Conducting *(1/6 unit or 0 unit per semester depending on grading option; Cat. I)*
This course will introduce students to the basic elements of conducting, such as gesture, music analysis, score preparation, and rehearsal techniques. Each section of the course is paired with a large ensemble to provide practical experience and opportunities between the areas of choral, band, orchestral, and jazz music. Course meeting times include during and outside of these set rehearsal times.

Recommended Background: A basic reading knowledge of music and simultaneous enrollment in the corresponding large music ensemble

Units: offered as both 1/6 unit per semester (ABC/NR) and 0 unit per semester (P/NR)

Anticipated instructors: include Professors Rohde, Lutch, Scinto, and Olsen

Rationale:
Conducting has been offered at WPI for many years to meet student demand and interest. Professor Rohde has been running a non-formalized section of this course associated with the WPI Choral Ensembles for the past 5+ years, consistently with 12 students involved each year. Similarly, instrumental students have asked for conducting instruction, leading to Professors Scinto and Lutch establishing the HU3910 – Conducting Practicum (D2023, D2024). Through offering the material as a standalone HUA Practicum, it became apparent through both professor and student feedback that the material did not fit the practicum format, further leading to this proposal.

The structure of this course is modeled after the music ensembles (MU2631 through MU2644) and individual private lessons (MU4621) that current exist at WPI, functioning over the course the semester. These courses are offered as both 1/6 cr and 0 cr, which allows students to participate multiple times.

Multiple sections of this course would run simultaneously each year, with each section being connected to the large music ensembles listed below, with one hour of additional instruction per week.

- MU2631 – Glee Club
- MU2632 – Alden Voices

- MU2636 – Concert Band
- MU2637 – Orchestra
- MU2644 – Stage Band

This course would be applicable to any of the 300 students currently enrolled in these large ensembles at WPI.

Impacts on students: The new course will impact current and future students by formalizing and cataloging the work that is already being undertaken, including:

- providing consistency across multiple areas of instruction (choral, band, orchestral, and jazz)
- providing documentation of the activity (such as enrollment figures to the Registrar and Administration)
- providing visibility for the work in the course catalog and on the transcripts of student participants
- providing opportunities for student feedback through regular anonymous student evaluations
- allowing such pre-existing work to count towards degree requirements

Resource Needs: No new resources are required. The course sections will be held in Alden Hall and the First Baptist Church. No laboratory or special information technology is required. No additional library support or resources are needed outside of standard required reading.

Implementation Date: The new course is expected to be implemented starting with the 2024-2025 Academic Year

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to remove MU 1511 Introduction to Music, MU 1611 Fundamentals of Music, and MU 2611 Fundamentals of Music II

Motion: On behalf of the Department of Humanities and Arts, the Committee on Academic Operation recommends, and I move that MU1511 Introduction to Music, MU1611 Fundamentals of Music I, MU2611 Fundamentals of Music II, and be removed.

Descriptions of courses to be dropped:

MU 1511. INTRODUCTION TO MUSIC *(Cat. I)*
This course, designed for students who have little or no previous experience in music, will present an approach to the study of music that includes studying some concepts of music theory (rhythms, scales, keys, intervals, harmony). The course will also include a study of some of the great masterpieces though listening, reading, and discussion.

MU 1611. FUNDAMENTALS OF MUSIC I *(Cat. I)*
This course concentrates on basic music theory of the common practice period. If time permits, instruction includes ear training, sight singing, and work on scales and intervals.

MU 2611. FUNDAMENTALS OF MUSIC II *(Cat. I)*
Fundamentals II is a course on music theory at the advanced level beginning with secondary dominants and modulations and working through 19th-century chromatic harmony.

Note: There are no changes to the WPI Undergraduate Catalog beyond deletion of the course listing and description.

What term is this course typically offered and is it Cat. I or Cat. II? Each of these three Cat. I courses have been offered every term in multiple sections.

Rationale:
Dropping these courses will enable the department to offer new courses, which are more appropriate preparation for students interested in one of WPI's music courses above the 1000 level and the music capstones (HU3900 and HU3910). The courses being dropped include a pedagogical focus in musical concepts that are no longer considered critical for success in other courses in the music curriculum.

These courses will be replaced by the following courses, which are proposed in separate motions:

MU 1000: Music and Its Makers
MU 1100: Foundations of Music Theory and Aural Skills

Impact on Distribution Requirements and Other Courses: Dropping MU1611, MU2611, and MU1511 will not affect distribution requirements.

Resources required: None.

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

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the title and number of MU 2720 Music History I: Medieval Through the Baroque

Motion: On behalf of the Music Division / Humanities and Arts Department, the Committee on Academic Operations (CAO) recommends, and I move that the name title and number of MU 2720 Music History I: Medieval Through the Baroque be changed, as described below.

Description of the Proposed Modifications:

Current course title, number, and description:

MU 2720: Music History I: Medieval Through the Baroque
This course provides a historical survey of Western music from Medieval through Baroque periods with an emphasis on understanding stylistic traits and theoretical concepts of the eras. Topics include Gregorian chant and secular monophony; evolution of musical notation; development of polyphonic music; and vocal and instrumental genres such as mass, motet, madrigal, opera, cantata, sonata, and concerto, among others.

No prior background in music is necessary.

This course will be offered in 2022-23, and in alternating years thereafter.

Proposed course title, number, and description:

MU 2001: History of Western Art Music Before 1750
This course provides a historical survey of Western music from Medieval through Baroque periods with an emphasis on understanding stylistic traits and theoretical concepts of the eras. Topics include Gregorian chant and secular monophony; evolution of musical notation; development of polyphonic music; and vocal and instrumental genres such as mass, motet, madrigal, opera, cantata, sonata, and concerto, among others.

No prior background in music is necessary.

Students may not receive credit for both MU 2720 and MU 2001

Rationale:
The previous title of the course problematically implies that the history of Western Art Music is the history of "Music" unspecified. The proposed name change makes clear the cultural tradition that is the focus of this course, which is Western Art Music. The new title is more concise and it specifies a date, which is consistent with Art History and History courses at WPI. The description removes specific statements about what years the course will be offered, but is otherwise unchanged.

Impacts on students: The proposed name change will make the content of the course more clear and will thus help students better navigate the curriculum and create a course of study.

Resources Needed: There are no resources required in order to support the proposed modification.

Implementation Date: The proposed changes are expected to be implemented starting from the 2024-25 Academic Year.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the title and number of MU 2721 Music History II: Classical to the Present

Motion: On behalf of the Music Division / Humanities and Arts Department, the Committee on Academic Operations (CAO) recommends, and I move that the title and number of MU 2721 Music History II: Classical to the Present be modified as described below.

Description of the Proposed Modifications:

Current course title, number, and description:

MU 2721: Music History II: Classical to the Present
This course provides a historical survey of Western music from the Classical period to the present with an emphasis on understanding stylistic traits and theoretical concepts of the eras. Topics include the development of genres such as sonata, string quartet, concerto, symphony, symphonic poem, character piece, Lied, and opera; and 20th century trends of impressionism, primitivism, atonality, serialism, minimalism, aleatory music, and electronic music. No prior background in music is necessary.

Proposed course title, number, and description:

MU 2002: History of Western Art Music After 1750
This course provides a historical survey of Western music from the Classical period to the present with an emphasis on understanding stylistic traits and theoretical concepts of the eras. Topics include the development of genres such as sonata, string quartet, concerto, symphony, symphonic poem, character piece, Lied, and opera; and 20th century trends of impressionism, primitivism, atonality, serialism, minimalism, aleatoric music, and electronic music. No prior background in music is necessary.

Students may not receive credit for both MU 2721 and MU 2002

Rationale:
The previous title of the course problematically implies that the history of Western Art Music is the history of "Music" unspecified. The proposed name change makes clear the cultural tradition that is the focus of this course, which is Western Art Music. The new title is more concise and it specifies a date, which is consistent with Art History and History courses at WPI. The revised description makes small grammatical corrections but is otherwise unchanged.

Impacts on students: The proposed name change will make the content of the course more clear and will thus help students better navigate the curriculum and create a course of study.

Resources Needed: There are no resources required in order to support the proposed modification.

Implementation Date: The proposed changes are expected to be implemented starting from the 2024-25 Academic Year.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the number of MU 3002 Arranging and Orchestration

Motion: On behalf of the Music Division / Humanities and Arts Department, the Committee on Academic Operations (CAO) recommends, and I move that the number of MU 3002 Arranging and Orchestration be modified as described below.

Description of the Proposed Modifications:

Current course title, number, and description:

MU 3002: Arranging and Orchestration *(1/3 Unit; Cat. I)*
Students will study specific characteristics of instruments and the voice to enable them to successfully arrange vocal and instrumental music. Students will need to possess a basic knowledge of music theory.

Suggested background for this course is MU 1611 (Fundamentals of Music I) or its equivalent.

Proposed course title, number, and description:

MU 2101: Arranging and Orchestration *(1/3 Unit; Cat. I)*
Students will study specific characteristics of instruments and the voice to enable them to successfully arrange vocal and instrumental music. Students will need to possess a basic knowledge of music theory.

Students may not receive credit for both MU 3002 and MU 2101

Suggested background for this course is MU 1100 (Foundations of Music Theory and Aural Skills) or its equivalent.

Rationale:
The need for the change arises from a lack of clarity between 2000 and 3000-level courses in the Music curriculum. This change hopes to better display course expectations by aligning it with other currently existing 2000-level courses.

To note, despite the change from the 3000 to 2000-level, the cap for this course should remain at 20 students. The rationale for this cap is both pedagogical, for teaching music composition, and practical, due to the limited number of computers in the Alden Hall B30 Music Technology Lab.

Impacts on students: The modification of the course number will impact current and future students through better organization of 1000, 2000, and 3000-level courses, to properly display an intended progression and level of difficulty throughout the Music curriculum. For example, the new number will clearly display how many elements of this course are comparable to MU 2723 – Music Composition.

Resources Needed: There are no resources required in order to support the proposed modification.

Implementation Date: The proposed changes are expected to be implemented starting from the 2024-25 Academic Year.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add RBE 4601 Human Factors and Human-Robot Interface

Motion: On behalf of the Robotics Engineering Department, the Committee on Academic Operations recommends, and I move that RBE 4601 Human Factors and Human-Robot Interface, as described below, be added.

Proposed Course Description:

RBE 4601 Human Factors and Human-Robot Interface
This is an introductory course on human-robot interaction. It will introduce the behavior and preference of human motor control and motor learning, and how they influence the design of human-robot interface and the dynamics of human-robot interaction. Students will also learn how to conduct human movement studies and social science studies for the design and evaluation of human-robot interfaces. Students in this course will work on interdisciplinary projects, which may involve working with experts in robotics, social science, nursing, and education.

Recommended Background: RBE 1001, RBE 3100

Anticipated Instructors: Professors Zhi Li

Anticipated enrollment: 30, one offering per year

Rationale:
The proposed course aims to address the need for an introductory course on human-robot interaction for upper-level undergraduate students, which will introduce: 1) the concepts and theory essential to the design of human-robot interaction and interfaces; 2) the examples of representative contemporary human-robot interfaces, and 3) the methods to conduct human experiment to evaluate human-robot interaction and interfaces. This course will also prepare the students for the graduate-level human-robot interaction course (RBE/CS 526), which focuses on the more advanced topics in human factors and methods for designing the robot autonomy to enable computational human-robot interaction. The trend in robotics is that, robots as the AI with physical embodiments, will collaborate closely with humans in the future of work and co-exist with human in daily life. The CS department offers a course on human-computer interaction (CS 3041) does not address specific interaction and interfaces for robots. Adding an undergraduate-level course dedicated to human-robot interaction will fill the gap in the current RBE undergraduate curriculum, and prepare the RBE undergraduate students for the job market in the era of Industry 4.0. It will also benefit the undergraduate students of other departments who need an HRI course and prepare them for the interdisciplinary projects (e.g., IQPs, MQPs) that concern the interaction of humans with AI and robotics (e.g., collaborative and assistive robots).

The course has been taught as an experimental course once in B Term 2022. 22 students were enrolled. The overall rating of the course was 3.7 and the instructor rating was 3.7.

Resources Needed: The course population will be limited to 30. No special requirements are needed for the classroom other than the 30-student capacity. A grader will be requested to support the instructor's course project management and grading.
Impact on Distribution Requirements and Other Courses: None

Implementation Date: Academic Year 2024-25

Contact: Prof. Zhi Li (MME) zli11@wpi.edu

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add RBE 4701 Artificial Intelligence for Robotics

Motion: On behalf of the Robotics Engineering Department, the Committee on Academic Operations recommends, and I move that RBE 4701: Artificial Intelligence for Robotics, as described below, be added.

Proposed Course Description:

RBE 4701, Artificial Intelligence for Robotics
This is an introductory course covering topics in artificial intelligence that are most relevant to robotics applications. Students will learn techniques for perception, planning, and actuation including: (i) informed, uninformed, and adversarial search; (ii) reasoning with uncertainty; (iii) reinforcement learning; and (iv) deep learning. The course will include a series of laboratories culminating in a final project on perception and navigation in a dynamic environment.

Recommended Background: RBE 3002

Anticipated Instructors: Professors Carlo Pinciroli, Constantinos Chamzas

Anticipated enrollment: 30, two offerings per year

Rationale:
This course fills an important gap in the course offering in robotics engineering. Courses on artificial intelligence, machine learning, neural networks, and reinforcement learning are offered by the Department of Computer Science; however, the techniques covered, and the nature of the laboratories and projects are not focused on the needs of robotics. This course, in contrast, will be designed to provide the students with a broad arsenal of techniques in artificial intelligence that are relevant to robotics and agent-oriented applications. This course will be instrumental in developing skills that will be valuable to students who pursue careers or advanced degrees in robotics and robotics engineering.
The course has been taught as an experimental course once in C Term 2023. 27 students were enrolled. The overall rating of the course was 4.8 and the instructor rating was 5.

Resources Needed: No additional needs.

Impact on Distribution Requirements and Other Courses: None.

Implementation Date: Academic Year 2024-25

Contact: Prof. Carlo Pinciroli (RBE) cpinciroli@wpi.edu

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the description of RBE 4815 Industrial Robotics

Motion: On behalf of the Robotics Engineering Department, the Committee on Academic Operations recommends, and I move that the course description of and recommended background for RBE 4815 Industrial Robotics be modified, as described below.

Description of Proposed Modifications:

Current course description:
RBE 4815. Industrial Robotics
This course introduces students to robotics within manufacturing systems. Topics include: classification of robots, robot kinematics, motion generation and transmission, end effectors, motion accuracy, sensors, robot control and automation. This course is a combination of lecture, laboratory and project work, and utilizes industrial robots. Through the laboratory work, students will become familiar with robotic programming (using a robotic programming language RAPID) and the robotic teaching mode. The experimental component of the laboratory exercise measures the motion and positioning capabilities of robots as a function of several robotic variables and levels, and it includes the use of experimental design techniques.

Recommended background: manufacturing (ME 1800), kinematics (ME 3310), control (ES 3011), and computer programming.

Proposed course description:
RBE 4815. Industrial Robotics
Throughout this course, students will be introduced to industrial robots and their applications. The course covers both industrial serial arm robots, such as those equipped with spherical wrist, and industrial parallel manipulators, such as the Stewart-Gough platform and Delta manipulator. Topics include mechanisms' degrees of freedom, inverse and forward kinematics (position and velocity), workspace, singularity, and manipulability analysis of industrial manipulators. Topics may extend to end effectors, motion accuracy, robot control and automation. This course is a combination of lecture, laboratory and project work. Students will engage in practical, hands-on learning experiences through the use of an industrial robot to apply theoretical knowledge to real-world scenarios, fostering comprehensive mastery of industrial robotics principles. Through the laboratory work, students will become familiar with industrial robotic programming while acquiring skills in working with industrial controllers such as Programmable Logic Controllers (PLC).

Recommended background: RBE 3001, ES 3011, and computer programming

Rationale:
For many years, RBE 4815 has been cross-listed with ME and MFE. However, the course was recently de-crosslisted and is now exclusively RBE 4815. The current version of the course has been designed to cater to students from all three disciplines, including ME, MFE, and RBE. As a result, RBE students have had to patiently endure with instructors focusing on principles of robotics, particularly robot kinematics, despite the majority of the class being RBE students.

Given the transition of the course to become a pure RBE course, it is prudent to update the curriculum. This entails removing the principles of robot kinematics, as this topic is already extensively covered in RBE 3001, and adding more content related to industrial robotics. Notably, the current version of the course overlooks a significant category of industrial robotics, namely parallel robots. By eliminating the principles

of robot kinematics from the course, we can create space to introduce industrial parallel robots into the curriculum.

The course description and the recommended background sections are updated to align with these changes.

Impact on Degree Requirements: None

Resources and Anticipated Instructors: No additional resources are required .

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

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add ECE 2039 Computational Engineering

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that ECE 2039 Computational Engineering, as described below, be added.

Proposed Course Description:

ECE 2039: Computational Engineering *(1/3 Units; Cat. I)*
Computational Engineering describes the methods and practices of software programming in the context of electrical and computer engineering (ECE), specifically, the construction of programs to be efficiently implemented on hardware. In this regard, the course covers programming design and methodology, developing efficient code using C programming language, hardware device abstraction, and modeling. In doing so, starting with basic programming techniques in the high-level programming language C, the course describes the relevant software and hardware device abstraction levels. Additionally, program analysis, debugging methods, issues encountered when interfacing with signals to/from external devices, and computer engineering models, such as finite state machines and timing in computing hardware, are explained. The course uses assignments/projects to provide hands-on experience with software programming to solve problems in electrical and computer engineering practice.

Recommended Background: A prior course in computer programming, such as CS 1004, CS 1101/2, or BME 1004.

Anticipated Instructors: Yarkin Doroz**;** Bashima Islam; and Bo Tang

Schedule: Fifty-minute lectures on Monday, Tuesday, Thursday, and Friday. One three-hour lab per week.

Rationale:
The proposed course prepares students to use computers for a wide range of problems within the scope of ECE. This course offers in-depth knowledge of programming, especially in relation to hardware device abstraction and modeling techniques specific to ECE. Currently, CS 2301 is considered a pre-requisite ("Recommended Background") for the ECE computer engineering curriculum, which explores advanced programming topics, including linked lists, classes, and garbage collection. However, it is not concerned with signals to/from external devices, actuation, and hardware device abstractions. This new course aims to improve ECE students' experience by ensuring a smooth transition to the higher-level courses in the computer engineering track, including ECE 2049 (Embedded Computing in Engineering Design) and ECE 3849 (Real Time Embedded Systems). Some examples of other courses that can benefit from the new course include ECE 2311/12 (Signal and System Analysis), ECE 340x (Foundations and Trends in Machine Learning for Engineering), ECE 4703 (Real Time DSP), ECE 4802 (Cryptography and Information Security), and ECE 4305 (Software-designed Radio System and Analysis).

Impacts on students: The new course will impact current and future ECE students by preparing them to solve Electrical and Computer Engineering problems using computers instead of solving those problems using mathematical analysis or building a hardware prototype. In this regard, this course provides insight into the steps leading from a programming language to instructions executing on a hardware processor, including the main programming abstraction levels and the tools/modeling techniques used to transform programs into instructions. As a result, the following outcomes are expected.

- Introduction to computer logic.
- Understand how we communicate with computers by learning the programming language C and UNIX.

- Learn about how to analyze, test, and debug code.
- Understand how time flows in computing systems.
- Learn how computing systems understand instructions.

Resources needs: Faculty members with a computer engineering background are expected to be involved in teaching the new course. Most of the lab equipment needed to teach this course is already available in the ECE department. The cost of acquiring new development boards is estimated at $5000.

Implementation date: This course will be offered in AY 24–25, likely in A- and C-terms. Depending on enrollment, we may need to consider additional yearly offerings.

Impact on distribution requirements and other courses: Note that, after consultation with the CS department, we have agreed that students *may* receive credit for both CS 2301 and this new course (ECE 2039). It is agreed that there are sufficient distinct learning objectives in ECE 2039, particularly with respect to hardware device abstractions and ECE applications, that some students would benefit from completion of both courses.

For most ECE majors, this new course will replace CS 2301 in the ECE major Distribution Requirements. Specifically, we will **delete** (in a separate motion) the following Distribution Requirement:

> Must include at least 1/3 unit of computer science (prefix CS), at the 2000-level or above (other than CS 2011, CS 2022, CS 3043 which cannot be applied to this requirement).

and **replace** it with:

> Must include at least 1/3 unit of computational engineering, satisfied by ECE 2039 (preferred for ECE students), or by any 2000-level or above CS course except CS 2011, CS 2022, and CS 3043.

Note that we will advise students with a single major in ECE to satisfy this requirement via the new Computational Engineering course. We will advise students who are double-majoring in CS or RBE that a 2000-level CS course (which would be part of their course of study in their CS/RBE major) satisfies this requirement. The experience of ECE faculty is that CS/RBE students have excellent background for our subsequent ECE courses; thus, we retain flexibility in this Distribution Requirement for these students.

The Recommended Background for ECE 2049 (Embedded Computing in Engineering Design) is updated in a separate accompanying motion.

Minor changes to the following courses will be proposed in separate motions:

Course	Changes
ECE 2049 (Embedded Computing in Engineering Design)	▪ The Recommended Background
ECE 2311 (Continuous-Time Signal and System Analysis)	▪ Minor changes to the description to list the new Computational Engineering course as the preferred Recommended Background (rather than CS 2301).
ECE 2312 (Discrete-Time Signal and System Analysis)	

Appendix: Lecture topics:

	Lecture topic	Class
Programming in C	Introduction to language levels: High Level Language (HLL)	1
	Language Levels: Assembly, Machine Language	2
	Variables: Scope and Storage Class	3
	Expressions: Bitwise, Arithmetic	4
	Control Flow: Iteration, Functions, Recursion	5
	Expressions: Bitwise, Arithmetic	6
	Data Structures: Arrays and Records	7
	Memory Management: Pointers	8
Hardware Device Abstractions	Stored-program Computer	9
	Number Representation and Endianess	10
	Instruction Set	11
	Memory: Address Space, C data structure mapping	12
	Input/Output: Files and Input/Output Memory	13
	Cost of storing Programs and Data	14
Programming Methodology	Resource Allocation	15
	Compiling, Linking, and Loading	16
	UNIX Makefile	17
	Program Debugging and Testing	18
	Measuring Computational Speed	19
Modeling Techniques	Finite State Machines as a Control model	20-21
	Modeling Time: Clock cycles, Events, Simulated time vs Wall clock time	22-23

Recommended material:

[1] Kernighan, B.W. and Ritchie, D.M., 2002. The C programming language.
[2] King, K.N., 2008. C Programming: A Modern Approach, 2nd Edition.
[3] Hanly, J.R. and Koffman, E.B., 2009. Problem Solving and Program Design in C.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add ECE 3405 Foundations and Trends in Machine Learning for Engineering

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that ECE 3405 Foundations and Trends in Machine Learning for Engineering, as described below, be added.

Proposed Course Description and Learning Objectives:

ECE 3405 Foundations and Trends in Machine Learning for Engineering
1/3 Unit, Category I

Machine learning has achieved huge success in many engineering applications such as computer vision, gene discovery, financial forecasting, credit card fraud detection, autonomous vehicle navigation, biomedical signal modeling, wireless/radar/aerospace systems and others. The course will briefly review discrete-time signals and systems, including convolution and Fourier transforms. This course will introduce the fundamental concepts, algorithms, and theories in machine learning, including linear models, projection/nonlinear embedding methods, neural networks/deep learning, parametric/non-parametric methods, kernel machines, mixture models, and pattern recognition/classification. Also, the lectures will briefly summarize recent trends in the field to provide students with cutting-edge knowledge for engineering. The course will give the student the basic ideas and intuition behind these methods, as well as a more formal understanding of how and why they work. Students will have an opportunity to experiment with machine learning techniques and apply them in one or more application-based projects.

Recommended Background: ECE 2312, Discrete-Time Signal and System Analysis; ECE 2039 Computational Engineering (pending course approval). Students who have taken ECE 340X may not get credit for ECE 3405.

Suggested Background: Linear Algebra (MA 2071) and Probability (MA 2621 or MA 2631).

Learning Objectives and ECE 3405 Outcomes:

After completing this course, a student will be able to:

1. Summarize key concepts in machine learning;
2. Use software tools to implement machine learning algorithms on a dataset;
3. Derive the mathematical formulation of the fundamental machine learning models;
4. Formulate and solve engineering application questions with appropriate machine learning methods.

Rationale:

An understanding of the concepts, algorithms, and theories of machine learning is fundamental to much of engineering modeling and automation and is also an important component of a college education for the modern world. This course addresses machine learning for engineering in a broad context. In the current ECE curriculum, traditional electrical and computer engineering courses have been rather isolated from modern machine learning technologies, and thus are rather narrow

in scope. Many peer universities such as Boston University, University of Maryland and Virginia Tech already offered such machine learning courses in the ECE department for undergraduates. Meanwhile, WPI ECE undergraduates have been consistently expressing interest in learning and applying machine learning technologies to various engineering applications. Therefore, this proposed course aims to fill in this gap in the current ECE curriculum. Students who desire further specialization in machine learning will need considerable advanced study. However, the concepts presented in this course will provide a valuable introductory knowledge set, regardless.

In contrast to existing course CS 4342 (Machine Learning) for undergrads, as listed in the table below, the proposed course not only introduces foundations of machine learning systematically, but also emphasizes engineering applications in the Electrical and Computer Engineering field. Many such applications are an extension of the dynamical system techniques taught in ECE 2312 (part of the Recommended Background), and provide useful background for a growing number of ECE MQPs. In summary, this course is especially important for ECE students to help shape their future careers, as the need for ECE graduates with engineering-based machine learning experience is growing rapidly. Also, this course is proposed for 3000 level that will better fit undergraduate study plans.

	ECE 3405	CS 4342
Lectures	a. Supervised learning (3 weeks) b. Unsupervised learning (1.5 weeks) **c. Semi-supervised learning (0.5 week)** d. Deep learning (1.5 weeks) e. Final project presentation (0.5 week) ECE applications are introduced in the lectures wherever they can demonstrate the usage of the algorithms. Topics include: dynamic systems, embedded systems, autonomous systems, etc.	a. Supervised learning (3.5 weeks) b. Unsupervised learning (0.5 week) c. Deep learning (2 weeks) d. Applications & final project presentation (1 week)
Homework & Projects	The homework is coding-based so that the students understand how to use machine learning algorithms to solve real-world problems. **Dynamic systems** are used as testbed in the projects, e.g., seizure prediction using EEG data, wind power prediction, stock prediction.	

This course was offered as experimental course ECE 340X “Foundations and Trends in Machine Learning for Engineering” to undergraduate students in B-term 2022 and 2023. For the permanent version of the course, we have moved MA 2071 from recommended background to suggested background based on the first-year teaching and student feedback.

The table below shows the enrollment, and the average course report ratings students gave on Question #1 (overall course rating), Question #2 (instructor rating), Question #7 (The amount I learned from the course), and Question #12 (well prepared to teach class) on a five point scale for each class session offered in the previous two years (1 represents “Very Poor” and 5 represents “Excellent”).

Year	Term	Course	Course Title	Class Size	Q#1	Q#2	Q#7	Q#12
2022	B	ECE 340X	Foundations and Trends in Machine Learning for Engineering	5 (2 ECE, 2 BME, 1 SSPS)	5	5	5	5
2023	B	ECE 340X	Foundations and Trends in Machine Learning for Engineering	14 (11 ECE, 2 RBE, 1 BME)				

The table also shows that the enrollment of ECE majors has significantly increased from two out of five, to 11 out of 14 enrolled students. This demonstrates that more ECE students realize the importance of machine learning in their future study and professional engineering careers.

Impacts on students: The course serves a critical complement to traditional ECE areas such as circuit design and embedding systems. Moreover, since this course is the only offering of machine learning principles for ECE undergraduates we anticipate a significant increase in enrollment over time.

Resources Needed: Faculty resources are available. Currently this course was taught by Professor Ziming Zhang. Additional faculty able to teach this course include Profs Xinming Huang, Bo Tang, and Bashima Islam.

Implementation Date: The new course is expected to be implemented starting from B-2024. Two 110-min lectures per week are offered.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add ECE 4901 CMOS Fundamentals

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that ECE 4901 CMOS Fundamentals, as described below, be added.

Proposed Course Description:

ECE 4901 CMOS Fundamentals *(1/3 Units, Cat. I)*
This course introduces fundamental concepts on CMOS (Complementary Metal Oxide Semiconductor) analog and digital circuit design, emphasizing the physical implementation of integrated circuits. To develop a fundamental understanding of CMOS integrated circuit design and layout, the course begins with a description of integrated circuit fabrication technology and crucial process layers to fabricate devices in CMOS technology. With this foundation, we discuss resistors and capacitors in integrated circuit technology, followed by MOSFET capacitors and MOSFET transistors, emphasizing concepts in nanoCMOS devices such as velocity saturation and drain-induced barrier lowering. Building on earlier concepts in this course, we develop models for analog and digital integrated circuit design using MOSFET. Next, the students will learn the concept of basic digital building blocks in CMOS technology and associated timing and loading constraints. Finally, the course explores matching and sensitivity concepts through a simple circuit example, a current mirror.

Recommended Background: ECE 2029 – Introduction to Digital Circuit Design, ECE 2201 – Microelectronic Circuits I. Students who have taken ECE 490X may not get credit for ECE 4901.

Suggested Background: ECE 3204 – Microelectronic Circuits II.

Learning Objectives: ECE 4901 Outcomes

1. Demonstrate an understanding of the basic fabrication layers in a CMOS process
2. Sketch a schematic from an integrated circuit layout
3. Discuss basic layout concerns for high-speed performance analog ICs
4. Demonstrate an understanding of the origins of the unwanted parasitics in a CMOS IC
5. Describe qualitatively how a MOSFET operates
6. Design static and dynamic logic gates
7. Demonstrate an understanding of timing constraints in CMOS
8. Demonstrate an understanding of matching and sensitivity in analog CMOS integrated circuits.

Rationale:
An understanding of the concepts of CMOS (Complementary Metal Oxide Semiconductor) analog and digital circuit design is fundamental to much of electronics and computer engineering and is also an essential component of a college education for the modern world. This course addresses semiconductor devices in the CMOS process and MOSFET operation in a broad context and in a manner that is accessible to essentially all WPI students. This course is essential for filling a considerable topic coverage gap between ECE 2201 and 3204 (microelectronics courses) and ECE

4902 (analog integrated circuit design course). Due to the renewed interest in the semiconductor industry, this course will play a critical role in educating the new generation of the semiconductor industry workforce. The proposed course represents a new approach to the topic, making it accessible to a much broader range of students. This course introduces basic engineering concepts of CMOS fundamentals within a broad context, including CMOS devices, with an emphasis on concepts in nanoCMOS devices, such as velocity saturation and drain-induced barrier lowering. Students pursuing a specialization in digital and analog integrated circuits will need considerable further study, but the concepts presented in the course will provide a valuable set of knowledge regardless of the student's specialization. Other departments and programs may use their judgment in the applicability of this course to their majors.

This course was offered as experimental course ECE 490X "CMOS Fundamentals" to undergraduate students in A-term 2022 and 2023.

The table below shows the enrollment, and the average course report ratings students gave on Question #1 (overall course rating), Question #2 (instructor rating), Question #7 (The amount I learned from the course), and Question #12 (well prepared to teach class) on a five-point scale for each class session offered in the previous two years (1 represents "Very Poor" and 5 represents "Excellent").

Year	Term	Course	Course Title	Class Size	Q#1	Q#2	Q#7	Q#12
2022	A	ECE 490X	CMOS Fundamentals	18	4.1	3.9	4.4	4.5
2023	A	ECE 490X	CMOS Fundamentals	23	4.1	3.7	4.3	4.3

As seen from the table, since the start of this course a decent number of student enrollment could be achieved. Moreover, since the offering of this course, it greatly helped the success of students in subsequent integrated circuits courses.

Impacts on students: The course serves a critical background to integrated circuit design courses, including ECE 4902 and ECE 524. This course provides in-depth learning in integrated circuit (IC) design of CMOS and MOSFET devices, a skill that is highly sought after by industry and is an integral part of graduate research opportunities within our ECE Department (and elsewhere).

Resource Needs: Faculty resources are available. Currently this course is taught by Professor Ulkuhan Guler. The industry standard software tool (CADENCE) is already available at WPI for ECE 4902 - Analog IC Design, and ECE 524 – Advanced Analog IC Design courses. The course can be taught without a lab. Additional ECE faculty capable of teaching this course include Profs. John McNeill and Suat Ay.

Implementation Date: Immediately upon WPI faculty approval of the new courses. The new course is expected to be implemented starting from A-2024. Two 110-min lectures per week are offered.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the description of ECE 2049 Embedded Computing in Engineering Design

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that the description of ECE 2049 Embedded Computing in Engineering Design be modified, as described below.

Description of the Proposed Modifications:
The proposed changes to the course description are as follows:

1. Revised description lists the new course ECE 2039 as the preferred computer programming "Recommended Background."
2. We also correct a few obvious grammar errors in the main text of the course description (delete the redundant word "play", and change "LCD display" to plural).

Current course number, title, and description:

ECE 2049 Embedded Computing in Engineering Design *(1/3 Units; Cat. I)*
Embedded computers are literally everywhere in modern life. On any given day we interact with and depend on dozens of small computers to make coffee, run cell phones, take pictures, play music play, control elevators, manage the emissions and antilock brakes in our automobile, control a home security system, and so on. Using popular everyday devices as case studies, students in this course are introduced to the unique computing and design challenges posed by embedded systems. Students will then solve real-world design problems using small, resource constrained (time/memory/power) computing platforms. The hardware and software structure of modern embedded devices and basic interactions between embedded computers and the physical world will also be covered in lecture and as part of laboratory experiments. In the laboratory, emphasis is placed on interfacing embedded processors with common sensors and devices (e.g. temperature sensors, keypads, LCD display, SPI ports, pulse width modulated motor controller outputs) while developing the skills needed to use embedded processors in systems design. This course is also appropriate for RBE and other engineering and CS students interested in learning about embedded system theory and design. Topics: Number/data representations, embedded system design using C, microprocessor and microcontroller architecture, program development and debugging tools for a small target processor, hardware/software dependencies, use of memory mapped peripherals, design of event driven software, time and resource management, applications case studies. Lab Exercises: Students will solve commonly encountered embedded processing problems to implement useful systems. Starting with a requirements list students will use the knowledge gained during the lectures to implement solutions to problems which explore topics such as user interfaces and interfacing with the physical world, logic flow, and timing and time constrained programming. Exercises will be performed on microcontroller and/or microprocessor based embedded systems using cross platform development tools appropriate to the target platform. Note: Students who have received credit for ECE 2801 may not receive credit for ECE 2049.

Recommended Background: ECE 2010 or equivalent knowledge in basic circuits, devices and analysis; and C language programming (CS 2301 or equivalent)

Suggested Background: ECE 2029 or equivalent knowledge of digital logic, logic signals and logic operations;

Proposed course number, title, and description:
(With added text in red and changed text highlighted in yellow.)

ECE 2049 Embedded Computing in Engineering Design *(1/3 Units; Cat. I)*
Embedded computers are literally everywhere in modern life. On any given day we interact with and depend on dozens of small computers to make coffee, run cell phones, take pictures, play music ~~play~~, control elevators, manage the emissions and antilock brakes in our automobile, control a home security system, and so on. Using popular everyday devices as case studies, students in this course are introduced to the unique computing and design challenges posed by embedded systems. Students will then solve real-world design problems using small, resource constrained (time/memory/power) computing platforms. The hardware and software structure of modern embedded devices and basic interactions between embedded computers and the physical world will also be covered in lecture and as part of laboratory experiments. In the laboratory, emphasis is placed on interfacing embedded processors with common sensors and devices (e.g. temperature sensors, keypads, LCD displays, SPI ports, pulse width modulated motor controller outputs) while developing the skills needed to use embedded processors in systems design. This course is also appropriate for RBE and other engineering and CS students interested in learning about embedded system theory and design. Topics: Number/data representations, embedded system design using C, microprocessor and microcontroller architecture, program development and debugging tools for a small target processor, hardware/software dependencies, use of memory mapped peripherals, design of event driven software, time and resource management, applications case studies. Lab Exercises: Students will solve commonly encountered embedded processing problems to implement useful systems. Starting with a requirements list students will use the knowledge gained during the lectures to implement solutions to problems which explore topics such as user interfaces and interfacing with the physical world, logic flow, and timing and time constrained programming. Exercises will be performed on microcontroller and/or microprocessor based embedded systems using cross platform development tools appropriate to the target platform. Note: Students who have received credit for ECE 2801 may not receive credit for ECE 2049.

Recommended Background: ECE 2039 (preferred for ECE majors) or a course in C language programming such as CS 2301/3 or equivalent; and ECE 2010 or equivalent knowledge in basic circuits, devices and analysis.~~; and C language programming (CS 2301 or equivalent).~~

Suggested Background: ECE 2029 or equivalent knowledge of digital logic, logic signals, and logic operations.

Rationale:
Concurrent with this change proposal is a proposal for a new ECE course, Computational Engineering (ECE 2039). This new course is intended as the primary programming introduction for ECE students, thus we insert it via this motion as the preferred programming background for ECE 2049. See the proposal for the new Computational Engineering course for the rationale for its introduction.

The problem of inadequate course sequencing has been particularly acute in the past few years for ECE 2049. Many instructors find themselves backtracking in lectures to teach the assumed

prerequisite material. Those students who did not complete the prerequisite ("Recommended") courses find the course pace too fast, while those who *did* complete the Recommended Background find the course pace too slow. This dissonance is defeating the purpose of Recommended Background courses and impeding the learning of all of our students.

Impacts on students: The student course sequence is unchanged, most ECE students will just take the new Computational Engineering course instead of CS 2301 as Recommended Background. We expect better compliance with the Recommended Background and our students should benefit from learning programming principles within an engineering application context over the two courses.

Resources Needed: No changes to the resources needed to teach ECE 2049.

Implementation Date: The changes are "backward compatible," thus can be implemented immediately.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the description of ECE 2311 Continuous-Time Signal and System Analysis

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that the description of ECE 2311 Continuous-Time Signal and System Analysis be modified, as described below.

Description of the Proposed Modifications:
The proposed changes to the course description are as follows:

1. It lists new course ECE 2039 as the preferred computer programming "Recommended Background."

Current course number, title, and description:

ECE 2311 Continuous-Time Signal and System Analysis *(1/3 Units; Cat. I)*
This course provides an introduction to time and frequency domain analysis of continuous time signals and linear systems. Topics include signal characterization and operations; singularity functions; impulse response and convolution; Fourier series; the Fourier transform and its applications; frequency-domain characterization of linear, time-invariant systems such as filters; and the Laplace transform and its applications.

Recommended Background: MA 2051, ECE 2019, and a prior course in computer programming such as CS 2301 or CS 1101/2/4.

Proposed course number, title, and description:
(With added text in red and changed text highlighted in yellow.)

ECE 2311 Continuous-Time Signal and System Analysis *(1/3 Units; Cat. I)*
This course provides an introduction to time and frequency domain analysis of continuous time signals and linear systems. Topics include signal characterization and operations; singularity functions; impulse response and convolution; Fourier series; the Fourier transform and its applications; frequency-domain characterization of linear, time-invariant systems such as filters; and the Laplace transform and its applications.

Recommended Background: ECE 2039 (preferred for ECE majors) or a prior course in computer programming such as CS 2301/3, CS 1004 or CS 1101/2; MA 2051; and ECE 2019.~~and a prior course in computer programming such as CS 2301or CS 1101/2/4.~~

Rationale:
Concurrent with this change proposal is a proposal for a new ECE course, Computational Engineering (ECE 2039). This new course is intended as the primary programming introduction for ECE students, thus we insert it via this motion as the programming background for ECE 2311. See the proposal for the new Computational Engineering course for rationale for its introduction.

Impacts on students: The ECE student course sequence is unchanged, most students will just take the new Computational Engineering course instead of CS 2301. We expect better compliance with the Recommended Background and our students should benefit from learning programming principles within an engineering application context.

Resources Needed: No changes to the resources needed to teach ECE 2311.

Implementation Date: The changes are "backward compatible," and thus can be implemented immediately.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the description of ECE 2312 Discrete-Time Signal and System Analysis

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that the description of ECE 2312 Discrete-Time Signal and System Analysis be modified, as described below.

Description of the Proposed Modifications:
The proposed changes to the course description are as follows:

1. It lists the new course ECE 2039 as the preferred computer programming "Recommended Background."
2. We also corrected a typographical error in the main text of the course description, changing "HR" to "IIR", and added a comma to the last sentence.

Current course number, title, and description:

ECE 2312 Discrete-Time Signal and System Analysis *(1/3 Units; Cat. I)*
This course provides an introduction to the time and frequency domain analysis of discrete-time signals and linear systems. Topics include sampling and quantization, characterization of discrete-time sequences, the discrete-time Fourier transform, the discrete Fourier transform and its applications, the Z transform and its applications, convolution, characterization of FIR and HR discrete-time systems, and the analysis and design of discrete-time filters. The course will include a focus on applications such as sampling and quantization, audio processing, navigation systems, and communications. Extensive use will be made of simulation tools including Matlab.

Recommended Background: MA 2051, ECE 2311, and a prior course in computer programming, such as CS 2301 or CS 1101/2/4.

Proposed course number, title, and description:
(With added text in red and changed text highlighted in yellow.)

ECE 2312: Discrete-Time Signal and System Analysis *(1/3 Units; Cat. I)*
This course provides an introduction to the time and frequency domain analysis of discrete-time signals and linear systems. Topics include sampling and quantization, characterization of discrete-time sequences, the discrete-time Fourier transform, the discrete Fourier transform and its applications, the Z transform and its applications, convolution, characterization of FIR and ~~HR~~ IIR discrete-time systems, and the analysis and design of discrete-time filters. The course will include a focus on applications such as sampling and quantization, audio processing, navigation systems, and communications. Extensive use will be made of simulation tools, including Matlab.

Recommended Background: ECE 2039 (preferred for ECE majors) or a prior course in computer programming such as CS 2301/3, CS 1004 or CS 1101/2; MA 2051; and ECE 2311~~, and a prior course in computer programming such as CS 2301 or CS 1101/2/4)~~.

Rationale:
Concurrent with this change proposal is a proposal for a new ECE course, Computational

Engineering (ECE 2039). This new course is intended as the primary programming introduction for ECE students; thus we insert it via this motion as the programming background for ECE 2312. See the proposal for the new Computational Engineering course for the rationale for its introduction.

Impacts on students: The student course sequence is unchanged, most ECE students will just take the new Computational Engineering course instead of CS 2301. We expect better compliance with the Recommended Background and our students should benefit from learning programming principles within an engineering application context.

Resources Needed: No changes to the resources needed to teach ECE 2312.

Implementation Date: The changes are "backward compatible" and thus can be implemented immediately.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the Program Distribution Requirements for the Electrical and Computer Engineering (ECE) major

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that the Program Distribution Requirements for the Electrical and Computer Engineering (ECE) major be modified, as described below.

Description of the Proposed Changes:

The proposed changes to ECE Program Distribution Requirements are as follows:

3. Delete the explanatory paragraph after the heading "Engineering Science and Design (ES/D) (including the MQP) (Minimum 18/3 Units)".
4. ECE previously had a 1/3 unit CS requirement (topically considered as part of the computer engineering sub-area of our major). That requirement can now *also* be satisfied by the proposed new course, Computational Engineering (ECE 2039).
5. The remaining changes split our existing 2/3 unit computer engineering requirements into two finer-grain computer engineering requirements, each comprised of 1/3 unit. There is no change in the total number of required computer engineering credits.
6. A few other changes were made to formatting (as marked).

Current relevant portion of the ECE major Program Distribution Requirements (from the new web-page based catalog):

Engineering Science and Design (ES/D) (including the MQP) (Minimum 18/3 Units)

Because modern engineering practice is increasingly interdisciplinary, all students achieve some breadth of study outside of the ECE department by taking a minimum of one Computer Science and two Engineering Science and Design courses. These courses must be at the 2000-level or higher, and certain courses with limited technical content are not credited towards this requirement. (See the formal requirements listed previously in the distribution requirements.) Many students find it advantageous to take more than the minimum CS course requirement. CS 2301 is highly recommended for ECE students.

Electrical and Computer Engineering Area (Minimum 15/3 Units)

Must include at least 5 units at the 2000-level or higher within the Electrical and Computer Engineering area (including the MQP). All courses with prefix ECE at the 2000-level or higher and ES 3011 are applicable to these 5 units.

Must include at least 1 unit of courses from these approved Electrical Engineering courses:

[Course list not included here; it is not changed by this petition.]

Must include at least 2/3 unit of courses from these approved Computer Engineering courses:

Approved Computer Engineering courses:

ECE 2029	Introduction to Digital Circuit Design	1/3
ECE 2049	Embedded Computing in Engineering Design	1/3
ECE 3829	Advanced Digital System Design with FPGAs	1/3
ECE 4801	Computer Organization and Design	1/3

Must include 1/3 unit of Capstone Design Experience. (This requirement is typically fulfilled by the MQP.)

Must include at least 1/3 unit of computer science (prefix CS), at the 2000-level or above (other than CS 2011, CS 2022, and CS 3043, which cannot be applied to this requirement).

Must include an additional 2/3 unit of engineering science and design at the 2000-level or above, selected from courses having the prefix AE, AREN, BME, CE, CHE, CS (other than CS 2011, CS 2022, CS 3043), ECE, ES, FP, ME, or RBE.

Current relevant portion of the ECE major Program Distribution Requirements (Modified from the new web-page-based catalog, with deleted text in ~~yellow strikethrough~~, and added text in red.)

Engineering Science and Design (ES/D) (including the MQP) (Minimum 18/3 Units)
~~Because modern engineering practice is increasingly interdisciplinary, all students achieve some breadth of study outside of the ECE department by taking a minimum of one Computer Science and two Engineering Science and Design courses. These courses must be at the 2000-level or higher, and certain courses with limited technical content are not credited towards this requirement. (See the formal requirements listed previously in the distribution requirements.) Many students find it advantageous to take more than the minimum CS course requirement. CS 2301 is highly recommended for ECE students.~~

Electrical and Computer Engineering ~~Area~~ Courses ~~(Minimum 15/3 Units)~~
Must include at least 5 units at the 2000-level or higher within ~~the~~ Electrical and Computer Engineering (ECE), ~~area (~~including the MQP~~)~~. Eligible courses consist of all ~~All courses with prefix ECE at the~~ 2000-level and~~or~~ higher courses with an ECE prefix and ES 3011 ~~are applicable to these 5 units~~.

The ECE ~~area~~ course units must~~Must~~ include at least 1 unit of courses from these approved Electrical Engineering courses:

[Course list not included here; it is not changed in this petition.]

The ECE ~~area~~ course units must~~Must~~ include at least ~~2~~1/3 unit of ~~courses from these approved~~ Computer Engineering courses with topics in digital circuit design, satisfied by any of:

Approved Computer Engineering courses with topics in digital circuit design:

ECE 2029	Introduction to Digital Circuit Design	1/3
~~ECE 2049~~	~~Embedded Computing in Engineering Design~~	~~1/3~~
ECE 3829	Advanced Digital System Design with FPGAs	1/3
~~ECE 4801~~	~~Computer Organization and Design~~	~~1/3~~

The ECE ~~area~~ course units must include at least 1/3 unit of Computer Engineering courses with topics in embedded computing, satisfied by any of:

Approved Computer Engineering courses with topics in embedded computing:

ECE 2049	Embedded Computing in Engineering Design	1/3

ECE 3849	Real-Time Embedded Systems	1/3
ECE 4801	Computer Organization and Design	1/3

The ECE ~~area~~ course units must~~Must~~ include 1/3 unit of Capstone Design Experience. (This requirement is typically fulfilled by the MQP.)

Other Engineering Science and Design Requirements

Must include an additional~~t least~~ 1/3 unit of ~~computer science (prefix CS)~~computational engineering, satisfied by ECE 2039 (preferably) or by any~~at the~~ 2000-level or above CS course except~~(other than~~ CS 2011, CS 2022, and CS 3043 ~~which cannot be applied to this requirement~~.

Must include an additional 2/3 unit of engineering science and design at the 2000-level or above, selected from courses having the prefix AE, AREN, BME, CE, CHE, CS (other than CS 2011, CS 2022, CS 3043), ECE, ES, FP, ME, or RBE.

Rationale:

Summary Note: This motion proposes no change to the total number of Engineering Science and Design credits required for the ECE major. The requirement remains at 6 units comprised of:

- 5 units of ECE courses (including the MQP),
- 1/3 unit computational engineering (previously a computer science requirement),
- 2/3 unit Additional Engineering Science and Design.

We also have not changed the required credits in each of the three categories listed above. We are adding a new ECE course that can be used to satisfy the second category listed above (1/3 unit computational engineering). We are also introducing some additional requirement detail to the 5 units of ECE courses. More detailed rationale follows for each change.

These changes facilitate our new course, Computational Engineering (ECE 2039). Rationale for this new course is provided in the motion to establish that course.

As for the specific change items described in the prior section:

1) [Deleted explanatory text] Most of this paragraph has been obsolete (thus inaccurate) without proper updating for a few years and the proposed changes in this motion make the remaining text obsolete and inaccurate.

2) [New "computational engineering" requirement] The new requirements list the new Computational Engineering course as "preferred" for fulfilling this requirement since we prefer that ECE "single-majors" complete this requirement via this new course. We retain the option for students to alternatively complete this requirement with a 2000+ CS course and will advise CS and RBE double-majors to do so. Our experience is that these double-major students already receive strong training in this curriculum area (so do we do not wish to force this change upon these students, as it would result in an additional and likely redundant course for such students).

3) [Split 2/3 unit computer engineering requirement into two 1/3 unit requirements] For our May 2019 ECE BS graduates (readily available data), 86/86 graduates met the 1/3 unit "digital circuit design" requirement (100%) and 84/86 graduates met the 1/3 unit

"embedded computing" requirement (97.7%). Hence, this proposed change will have a minor influence on final course selection. However, some of our first-year and sophomore students are struggling to plan their courses. The finer-grain requirements should help them develop a better plan of study and more properly order within-major courses. Additionally, the lack of finer-grain requirements has been of concern to the ECE Advisory Committee. The inclusion of these more detailed requirements better describes the academic preparation received by our graduating students.

4) [Format changes] The new on-line catalog does not preserve the enumeration of degree requirements found in prior hardcopy/PDF catalogs and the current on-line draft does not properly separate distinct requirements. Our changes in this petition attempt to resolve these issues.

Impacts on students: As explained in more detail in the concurrent proposal to add the new course Computational Engineering (ECE 2039), many of our students are not completing the existing computer science course requirement as the "Recommended Background" for our entry embedded computing course. Many students seem to be struggling with the presentation of software topics when not linked to electrical and computer engineering applications. Hence, ECE proposes to offer a computational engineering course in lieu of the existing computer science requirement. The intended impact is to better interest students in programming within an engineering context. In doing so and by prominently sequencing this new ECE course within our curriculum, we anticipate resolving the problem of students not obtaining the Recommended Background for subsequent courses. The overall impact is to improve the sequencing of student learning to the student's advantage.

From the standpoint of requirements, the new Computational Engineering course will, for most ECE students, be a one-for-one replacement for our existing computer science requirement. Hence, there is no intended impact on student course sequencing (other than substituting the new ECE course for the existing CS 2301).
As noted above, splitting the existing 2/3 unit computer engineering requirement into two 1/3 unit requirements will have little impact, since nearly all students already meet this requirement. For students who are an exception, the finer grain requirements should provide more robust computer engineering training.

Resource Needs: No new resources are required specifically for the changes to the Program Distribution Requirements. Requirements related to the new Computational Engineering course (ECE2039) are described in the proposal for that new course.

Implementation Date: Academic year 2024–2025.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to further modify the Program Distribution Requirements for the Electrical and Computer Engineering (ECE) major.

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations (CAO) recommends, and I move that two new courses (ECE 3405 Foundations and Trends in Machine Learning for Engineering, and ECE 4901 CMOS Fundamentals) be added to the list of courses satisfying the ECE Program Distribution Requirement, as described below.

Detailed description of the motion:
On page 552 of the 2023-24 WPI Undergraduate Catalog, ECE has a Program Distribution Requirement by which each student's course of study: "Must include at least 1 unit of courses from these approved Electrical Engineering courses:" within the subsection titled "Electrical and Computer Engineering Area", which is within the section titled "Engineering Science and Design (ES/D)". As of December 2023, this list of approved course consists of 14 ECE courses and ES 3011.

The current proposal would add two new courses:

- ECE 3405 Foundations and Trends in Machine Learning for Engineering, and
- ECE 4901 CMOS Fundamentals

to the list of approved courses for this degree requirement. The two new courses are added in two separate motions that are included the Feb. 14, 2024 consent agenda.

Rationale:
Each of these new courses is appropriate to add to the list of "Electrical Engineering" courses. They provide additional options for students to complete their ECE major and each provides more advanced study in their respective course areas.

Impacts on students: Students will have additional course options for completing their degree requirements.

Resource Needs: None associated with this motion.

Implementation Date: Immediately upon WPI faculty approval of the new courses. We anticipate each course to first be taught under their permanent numbers in the 2024–2025 academic year.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to separate CHE 501/502 Seminar into two courses

Motion: On behalf of the Chemical Engineering Department, the Committee on Graduate Studies and Research recommends, and I move that, as described below. CHE 501/502 Seminar be separated into the following two courses: CHE 501 Professional Development for Chemical Engineering Doctoral Students; and CHE 502 Professional Development for Chemical Engineering Master's Students, as described below

Description of the Proposed Modifications:
The proposal would separate CHE 501/502 Seminar into the following two courses:

- CHE 501 Professional Development for Chemical Engineering Doctoral Students; and
- CHE 502 Professional Development for Chemical Engineering Master's Students

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Current Course Description: (on page 273 of 2023-24 Graduate Catalog)

CHE 501-502: Seminar *(0 Credits)*
Reports on current advances in the various branches of chemical engineering or on graduate research in progress. Must be taken during every semester in residence.

Proposed Course Descriptions:

CHE 501: Professional Development for Chemical Engineering Doctoral Students *(0 Credits)*
This course provides professional development for chemical engineering students in the Ph.D. program. Topics covered may include: developing professional identities and networks, exploring chemical engineering career paths, setting career goals, improving technical and non-technical communication skills, analyzing ethical challenges in chemical engineering, and supporting diversity, equity, inclusion, and wellness in professional environments. Must be taken for eight semesters during Ph.D. program.

CHE 502: Professional Development for Chemical Engineering Master's Students *(0 Credits)*
This course provides professional development for chemical engineering graduate students in the M.S. program. Topics covered may include: developing professional identities and networks, exploring chemical engineering career paths, setting career goals, improving technical and nontechnical communication skills, analyzing ethical challenges in chemical engineering, and supporting diversity, equity, inclusion, and wellness in professional environments. Must be taken for two semesters during M.S. program.

Rationale:
The current course title and description of CHE 501/502: Seminar do not reflect the course material. The original intent of the course was to provide graduate students with the opportunity to present research in progress or discuss recent advances in chemical engineering. As the course was delivered, professional development skills relevant to graduate students were integrated into

the course content and ultimately the faculty in the department collectively decided that these skills are essential to graduate student learning and development. The course learning objectives and course structure have been modified iteratively in response to faculty and student feedback for >12 semesters. The most recent updates resulted in distinct professional development requirements and separate course sections for M.S. students and Ph.D. students. These changes have ultimately transformed the course and an update to the course title and description are necessary. The current course learning objectives and course structure were agreed upon and voted into practice by the Chemical Engineering Faculty in Fall 2022. This course is taught in the Fall and Spring semesters annually.

Impact on Degree Requirements: The course is a requirement for chemical engineering graduate students. MS students are required to complete two semesters of the course and PhD students are required to complete eight semesters of the course. The prior requirement was for all graduate students to enroll in the course during every semester in residence. Ph.D. 60 students defending less than four years after entering the program can apply to the Graduate Committee to waive up to two semesters of CHE 501. Professional Development for Chemical Engineering Doctoral Students, which is proposed to be updated in Chemical Engineering Program of Study Section of the Graduate Student Catalog in a separate motion.

Resources and Anticipated Instructors: No new resources are needed. The current chemical engineering faculty can teach this course.

Implementation Date: 2024-2025 Academic Year.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to update Chemical Engineering graduate catalog text to reflect CHE 501/502 changes

Motion: On behalf of the Chemical Engineering Department, the Committee on Graduate Studies and Research recommends, and I move that WPI Graduate Catalog text related to the Chemical Engineering Degree be updated to reflect the new course title and requirements for CHE 501 and CHE 502, as described below.

Description of the Proposed Modifications:
There are five modifications to the WPI Graduate Catalog, es described below:

1) Modification #1

Current Graduate Catalog Descriptions:
(On pages 58, 59, and 60 of the 2023-24 Graduate Catalog)
Current Catalog Text is the same for "Chemical Engineering M.S. Program of Study: Course-based Option", "Chemical Engineering M.S. Program of Study: Thesis-based Option" and "Chemical Engineering M.S. Program of Study: Professional Engineering Option"

> All full-time M.S. students must complete one year of seminar (one fall semester and one spring semester). Parttime M.S. students must either complete one year of seminar in-person or develop an individual plan for achieving equivalent professional development training that is approved and assessed by the seminar instructor. Seminar is designated CHE 501 (fall) and CHE 502 (spring) and separated by section – make sure to choose the M.S. section. Seminar meets every other week throughout the fall and spring semester.

Proposed Graduate Catalog Descriptions: (with changes in red)
Text updates for the following programs - "Chemical Engineering M.S. Program of Study: Course-based Option", "Chemical Engineering M.S. Program of Study: Thesis-based Option" and "Chemical Engineering M.S. Program of Study: Professional Engineering Option"

> All full-time M.S. students must complete one year of CHE 502 Professional Development for Chemical Engineering Master's Students (one fall semester and one spring semester). Part time M.S. students must either complete one year of CHE 502 Professional Development for Chemical Engineering Master's Students in-person or develop an individual plan for achieving equivalent professional development training that is approved and assessed by the CHE 502 Professional Development for Chemical Engineering Master's Students instructor.

2) Modification #2

Current Graduate Catalog Descriptions:
(On pages 58, 59, and 60 of the 2023-24 Graduate Catalog)

There are three tables in each of the M.S. Programs that have a row listing CHE 501-502 Seminar at 0 credits.

Proposed Graduate Catalog Descriptions: (with changes in red)
There are three tables with the course number and title in the M.S. Program of Study section that will be updated to reflect the course number and title change from "ChE 501/502: Seminar" to "ChE 502 Professional Development for Chemical Engineering Master's Students".

3) Modification #3

Current Graduate Catalog Descriptions:
(On pages 61 of the 2023-24 Graduate Catalog)
Current Graduate Catalog Text for Chemical Engineering Ph.D. (90 credits) Program of Study

> **"**Ph.D. students must complete eight semesters of seminar (CHE 501/502: Seminar)**"**

Proposed Graduate Catalog Descriptions: (with changes in red)
Proposed Graduate Catalog Text for Chemical Engineering Ph.D. (90 credits) Program of Study

> **"**Ph.D. students must complete eight semesters of CHE 501 Professional Development for Chemical Engineering Doctoral Students**"**

4) Modification #4

Current Graduate Catalog Descriptions:
(On pages 61 of the 2023-24 Graduate Catalog)
Current Graduate Catalog Text for Chemical Engineering Ph.D. (60 credits) Program of Study

> Ph.D. 60 students defending less than four years after entering the program can apply to the Graduate Committee to waive up to two semesters of seminar (CHE 501/502: Seminar). Otherwise, Ph.D.60 students must complete eight semesters of seminar

Proposed Graduate Catalog Descriptions: (with changes in red)
Proposed Graduate Catalog Text for Chemical Engineering Ph.D. (60 credits) Program of Study

> Ph.D. 60 students defending less than four years after entering the program can apply to the Graduate Committee to waive up to two semesters of CHE 501 Professional Development for Chemical Engineering Doctoral Students. Otherwise, Ph.D. 60 students must complete eight semesters of CHE 501 Professional Development for Chemical Engineering Doctoral Students.

5) Modification #5

Current Graduate Catalog Descriptions:
(On pages 61 of the 2023-24 Graduate Catalog)
There are two tables in each of the Ph.D. Programs that have a row listing CHE 501-502 Seminar at 0 credits.

Proposed Graduate Catalog Descriptions: (with changes in red)
The two course requirement tables will be updated to reflect the course number and title change from "CHE 501/502: Seminar" to "CHE 501 Professional Development for Chemical Engineering Doctoral Students".

Rationale:
The text within the Chemical Engineering Program of Study section of the Graduate Catalog will be updated to reflect changes in the course number and course title for CHE 501/502: Seminar.

Implementation Date: 2024-2025 Academic Year.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add ME 527 Foundations of Robotics as cross-listed with current RBE 500

Motion: On behalf of the Mechanical Engineering Graduate Program, the Committee on Graduate Studies and Research recommends, and I move that ME 527 Foundations of Robotics be added as cross-listed with the current RBE 500 Foundations of Robotics, as described below.

Proposed Course Description:
The proposal would add a cross listing of ME 527 to RBE 500 Foundations of Robotics, as follows:

ME 527/RBE 500 Foundations of Robotics *(3 Credits)*
Fundamentals of robotics engineering. Topics include forward and inverse kinematics, velocity kinematics, introduction to dynamics and control theory, sensors, actuators, basic probabilistic robotics concepts, fundamentals of computer vision, and robot ethics. In addition, modular robot programming will be covered, and the concepts learned will be applied using realistic simulators.

Prerequisites: Differential Equations (MA 2051 or equivalent), Linear Algebra (MA 2071 or equivalent) and the ability to program in a high-level language

Rationale:
RBE 501 Robot Dynamics is a fundamental course that is already cross-listed as an ME course. As part of the changes that RBE recently made to its courses, RBE 500 Foundations of Robotics is now a pre-requisite for RBE 501. RBE 500 is an even more fundamental course, that should also have an ME cross-listing, so that ME students interested in controls and dynamics may take both RBE 500 and RBE 501 and count them as ME courses. ME students are already allowed by the ME graduate committee to count both RBE 500 and 501 as ME courses for the purpose of degree requirements. The proposed numbering of "ME 527" also follows our numbering convention that the second digit '2' is used for controls/dynamics courses, and that 3-digit numbers should be used for semester-long courses. This number has not been used in the past 10 years.

Impact on Degree Requirements: This change will have no impact on degree requirements. This change has already been made in practice.

Resources and Anticipated Instructors: No additional resources needed.

Implementation Date: Academic Year 2024-2025.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify the cross-listed number of ME 501/RBE 501 Robot Dynamics to ME 528/RBE 501

Motion: On behalf of the Mechanical Engineering Graduate Program, the Committee on Graduate Studies and Research recommends, and I move that the course number for the ME 501 Robot Dynamics (cross-listed with BE 501 be modified from ME 501 to ME 528.

Description of Proposed Modification:
Currently ME 501 Robot Dynamics is cross-listed with RBE 501 Robot Dynamics. The proposal would change the ME course number to ME 528.

Proposed Course Number with Current Course Description:

ME 528/RBE 501 Robot Dynamics *(3 Credits)*
Foundations and principles of robot dynamics. Topics include system modeling including dynamical modeling of serial arm robots using Newton and Lagrange's techniques, dynamical modeling of mobile robots, introduction to dynamics-based robot control, as well as advanced techniques for serial arm forward kinematics, trajectory planning, singularity and manipulability, and vision-based control. In addition, dynamic simulation techniques will be covered to apply the concepts learned using realistic simulators. An end of term team project would allow students to apply mastery of the subject to real-world robotic platforms.

Prerequisites: RBE 500 or equivalent

Rationale:
The proposed new numbering follows our program's numbering convention that the second digit '2' is used for controls/dynamics courses, and that 3-digit numbers should be used for semester-long courses. The numbering will also logically follow the proposed cross-listing of RBE 500 as ME 527. This number has not been used in the past 10 years. Furthermore, the new number eliminates potential confusion caused by the old number of "ME 501", which could be confused as belonging to the sequence of mathematics courses (ME 500 and ME 5001) in our ME program.

Impact on Degree Requirements: This change will have no impact on degree requirements, since this is already a cross-listed course.

Resources and Anticipated Instructors: No additional resources needed.

Implementation Date: Academic Year 2024-2025.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to remove ME cross-listings from RBE 510/ME 5204, RBE 521/ME 521, RBE 580/BME 580/ME 5205, and RBE 530/ME 530

Motion: On behalf of the Mechanical Engineering Graduate Program, the Committee on Graduate Studies and Research recommends, and I move that the ME cross-listings be removed from RBE 510/ME 5204 Multi-Robot Systems, RBE 521/ME 521 Legged Robotics, and RBE 530/ME 530 Soft Robotics, and RBE 580/ME 5205 Biomedical Robotics.

Description of Proposed Revisions:
The proposal would remove the ME cross-listings from the following courses (with course numbers to be deleted ~~struckthrough~~):

RBE 510~~/ME 5204~~ Multi-Robot Systems *(2 Credits)*
This course covers the foundation and principles of multi-robot systems. The course will cover the development of the field and provide an overview on different control architectures (deliberative, reactive, behavior-based and hybrid control), control topologies, and system configurations (cellular automata, modular robotic systems, mobile sensor networks, swarms, heterogeneous systems). Topics may include, but are not limited to, multirobot control and connectivity, path planning and localization, sensor fusion and robot informatics, task-level control, and robot software system design and implementation. These topics will be pursued through independent reading, class discussion, and a course project. The course will culminate in a group project focusing on a collaborative/cooperative multi-robot system. The project may be completed through simulation or hands-on experience with available robotic platforms. Groups will present their work and complete two professional-quality papers in IEEE format.

Prerequisites: Linear algebra, differential equations, linear systems, controls, and mature programming skills, or consent of the instructor.

Students cannot receive credit for this course if they have taken the Special Topics (ME 593S) version of the same course.

RBE 521~~/ME 521~~ Legged Robotics *(3 Credits)*
Foundations and principles of parallel manipulators and legged robots. Topics include advanced spatial/3D kinematics and dynamics of parallel manipulators and legged robots including workspace analysis, inverse and forward kinematics and dynamics, motion analysis and control, and gait and stability/balance analysis of legged robots. The course will be useful for solving problems dealing with parallel manipulators as well as multilegged robots including, but not limited to, quadruped robots, hexapod robots and any other types of multilegged robots. A final term project allows students to show mastery of the subject by designing, analyzing, and simulating parallel and/or legged robots of their choice.

Recommended Background: RBE 300, RBE 301

RBE 530~~/ME 530~~ Soft Robotics *(2 Credits)*
Soft robotics studies "intelligent" machines and devices that incorporate some form of compliance in their mechanics. Elasticity is not a byproduct but an integral part of these systems, responsible for inherent safety, adaptation and part of the computation in this class of robots. This course will cover a number of major topics of soft robotics including but not limited to design and fabrication of soft systems, elastic actuation, embedded intelligence, soft robotic modeling and control, and fluidic power. Students will implement new design and fabrication methodologies of soft robots, read recent literature in the field, and complete a project to supplement the course material. Existing soft robotic platforms will be available for experimental work.

Prerequisites: Differential equations, linear algebra, stress analysis, kinematics, embedded programming.

RBE 580/BME 580~~/ME 5205~~ Biomedical Robotics *(2 Credits)*
This course will provide an overview of a multitude of biomedical applications of robotics. Applications covered include: image-guided surgery, percutaneous therapy, localization, robot-assisted surgery, simulation and augmented reality, laboratory and operating room automation, robotic rehabilitation, and socially assistive robots. Specific subject matter includes: medical imaging, coordinate systems and representations in 3D space, robot kinematics and control, validation, haptics, teleoperation, registration, calibration, image processing, tracking, and human-robot interaction.Topics will be discussed in lecture format followed by interactive discussion of related literature. The course will culminate in a team project covering one or more of the primary course focus areas.

Recommended Background: Linear algebra, ME/RBE 301 or equivalent

Students cannot receive credit for this course if they have taken the Special Topics (ME 593U) version of the same course.

Rationale:
The cross-listed courses are not foundational and fundamental topics that should have ME cross-listings, but are rather more specialized topics in particular areas of robotics, which would be suitable for ME students to take as electives, rather than as ME courses. These cross-listings are remnants of RBE's past association with MME, and are now unnecessary.

Two foundational RBE courses RBE 500/ME 527 Foundations of Robotics and RBE 501/ME 528 Robot Dynamics will still have ME cross-listings.

Impact on Degree Requirements: ME MS and PhD students still can take these RBE courses. However, they will be now counted as electives in the ME MS and PhD programs. These new requirements will apply to students who enroll in Fall 2024. Students that have already taken or are registered to take the ME cross-listed versions of these courses can still count them as ME courses. Any course offerings that are already scheduled will not be impacted.

Resources and Anticipated Instructors: No additional resources needed.

Implementation Date: Academic Year 2024-2025.

Date: February 14, 2024
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify Materials and Manufacturing Engineering Doctoral Qualifying/ Comprehensive Examination requirements

Motion: On behalf of the Materials and Manufacturing Engineering graduate Pprogram, the Committee on Graduate Studies and Research recommends, and I move that the requirements for the Materials Engineering Doctoral Qualifying/Comprehensive Examination (MEDQE) be modified in the graduate catalog as described below.

Description of the Proposed Modifications:

Current Catalog Description for the Materials Engineering Doctoral Qualifying/ Comprehensive Examination:
(see page 109 of 2023-24 Graduate Catalog)

Admission to candidacy will be granted only after the student has satisfactorily passed the Materials Engineering Doctoral Qualifying/ Comprehensive Examination (MEDQE). The purpose of this exam is to determine if the student's breadth and depth of understanding of the fundamental areas of materials engineering is adequate to conduct independent research and successfully complete a Ph.D. dissertation. The MEDQE consists of both written and oral components. The written exam must be successfully completed before the oral exam can be taken. The oral exam is usually given within two months of the completion of the written exam. The MEDQE is offered at least one time each year. A member of the materials science and engineering faculty will be appointed to be the chairperson of the MEDQE Committee. This person should not be the student's Ph.D. thesis advisor; but that advisor may be a member of the MEDQE Committee. Others on the committee should be the writers of the four sections of the examinations and any other faculty selected by the chairperson. Faculty from other departments at WPI or other colleges/universities, as well as experts from industry, may be asked to participate in this examination if the materials engineering faculty deems that it is appropriate. At least one year prior to completion of the Ph.D. dissertation, the student must present a formal seminar to the public describing the proposed dissertation research project. This Ph.D. research proposal will be presented after admission to candidacy. The current MEDQE requirements are shown below. We propose to modify these requirements as indicated in red font. For clarity, the MEDQE requirements with proposed changes incorporated are shown after the current version.

Proposed Catalog Description for the Materials Engineering Doctoral Qualifying/ Comprehensive Examination:
Admission to candidacy will be granted only after the student has satisfactorily passed the Materials Science & Engineering Doctoral Qualifying/ Comprehensive Examination (MSEDQE). The purpose of this exam is to determine if the student's breadth and depth of understanding of the fundamental areas of materials engineering is adequate to conduct independent research and successfully complete a Ph.D. dissertation.

The MSEDQE consists of four written components and is offered at least one time each year.
The MSEDQE Committee should be the writers of the four sections of the examinations. Faculty from other departments at WPI or other colleges/universities, as well as experts from industry,

may be asked to participate in this examination if the materials science and engineering faculty deems that it is appropriate. A member of the materials science and engineering faculty will be appointed to be the chairperson of the MEDQE Committee by the program director. This person should not be the student's Ph.D. thesis advisor; but that advisor may be a member of the MSEDQE Committee.

At least one year prior to completion of the Ph.D. dissertation, written and oral presentation of the Ph.D. Research Proposal is required to be approved by a dissertation committee. The student must present a formal seminar to the dissertation committee and the public describing the proposed dissertation research project. This Ph.D. research proposal will be presented after admission to candidacy.

Rationale:
The existing Ph.D. degree requirements for Materials Science and Engineering encompass written qualifying exams, an oral qualifying exam, a research proposal, and a dissertation defense. Currently, the oral qualifying exam requires that students review one or two research papers selected in consultation with their advisors.

However, the faculty of materials science and engineering program have observed that the purposes of both the written and oral proposals overlap significantly with the qualifying exam, consisting of both written and oral part, essentially gauging the student's understanding of specific areas within materials science and engineering. To understand how our program compares to others, we conducted a study of the Ph.D. qualifying examination requirements in Materials Science and Engineering programs from highly esteemed peer institutions, with an emphasis on private institutions. Significantly, none of the ten surveyed programs demand all four components we currently require: written examinations, oral examination, proposal, and defense of dissertation. Most peer institutions equate our proposal requirement to their oral examination criteria. Those with such an oral exam criterion do not impose an added proposal mandate. To eliminate redundancies and align more closely with leading peer programs, we propose the discontinuation of the oral examination requirement for Ph.D. candidates in Materials Science and Engineering.

Impact on Degree Requirements: This proposed change does not diminish the rigor of the degree requirements. Instead, it streamlines the process by eliminating redundant formalities and aligns our program's requirements more closely with those of our peer institutions.

Resources Needed: No new resources are required.

Implementation Date: AY 2024-2025