

WORCESTER POLYTECHNIC INSTITUTE

December 2, 2021

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

The fourth Faculty meeting of the 2021-2022 academic year will be held on **Thursday, December, 2021** at 3:15pm via Zoom (join after 3:00 pm) at <https://wpi.zoom.us/j/93125841717> .

1. Call to Order M. Richman
 - Approval of the Agenda
 - Consideration of the Minutes from Sept. 30, 2021 and Oct. 7, 2021

2. Committee Business:
 - Committee on Academic Operations (CAO) L. Titova
 - December 2021 Undergraduate Student Graduation List

 - Committee on Graduate Studies and Research (CGSR) D. Korkin
 - December 2021 Graduate Student Graduation List

 - Committee on Academic Policy (CAP) O. Pavlov
 - Motion to adopt a policy for awarding posthumous undergraduate degrees

3. Committee Report: Committee on Information Technology Policy (CITP) R. Cowlagi
 - IT Policies Related to the Privacy of WPI Community Members**

4. President's Report L. Leshin

5. Provost's Report W. Soboyejo

6. New Business

7. Closing Announcements

8. Adjournment

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WORCESTER POLYTECHNIC INSTITUTE
Faculty Meeting Minutes
September 30, 2021

Summary:

1. Call to Order
2. Open Discussion: CASL
3. Adjournment

Detail:

1. Call to Order

The second Faculty meeting of the 2021-2022 academic year was called to order at 3:15 pm on Zoom by **Prof. Richman** (AE). The meeting agenda was approved.

Prof. Richman thanked the community for the outpouring of concern about the issue of community wellbeing, in general, and student mental health, in particular. As a result, the original plan to devote a portion of the October 7th meeting to student well-being was expanded to devote today's special meeting entirely to the topic. Prof. Richman thanked Prof. Barton (Chair, CASL) and all the members of CASL for all their extra work in the last few weeks. Prof. Richman also thanked Pres. Leshin, Provost Soboyejo, and Charlie Morse (Director, SDCC) for their serious involvement in arranging this meeting.

2. Open Discussion

Committee on Advising and Student Life (CASL):

Prof. Barton (HUA), as Chair of CASL, was focused on what the faculty can do to improve the wellbeing of our students, but he pointed out that the answer is not restricted to a particular office or committee, and that we cannot solve problems that are bigger than our campus. CASL is proposing that at this meeting we first ask appropriate questions and/or propose measures that we can take to address the issues of concern. To organize today's discussion, Prof. Barton suggested categorizing our suggestions as either short-term or long-term actions. CASL will take this information back to deliberate, organize, and meet with the Mental Health and Well Being Task Force to allocate appropriate tasks and responsibilities. (See Addendum #1 on file with these minutes.)

Dir. Morse (Assoc. Dean, Dir. SDCC) thanked the community for its recent support and explained the unprecedented nature of three suicides in less than three months. Student requests for counseling support are now 30 percent over our highest levels ever, but students are able to get counseling appointments within 24 to 48 hours of any initial contact. Dir. Morse suggested that the faculty focus on flexibility and student engagement. Flexibility means support by providing students extra time or offering incompletes to extend grade deadlines, all within the constraints of meeting the requirements of the class. Student engagement means contacting students when it appears they are losing touch with the course, and communicating with all advisees. Dir. Morse emphasized the importance to students of active dialogue with their professors. Dir. Morse also suggested attending one of several sessions that the SDCC is offering on the topic of recognizing and responding to student distress. He closed by describing how inspired he was when a particular faculty member recently responded to a student in distress by assuring the student that life is so much bigger than any one course obligation and assured them that they would get through the moment together.

Prof. Richman added that the purpose of this meeting is to hear from as many people as possible in the hope that we will compile a list of items to contemplate and act upon. Formal motions in this informal discussion are not appropriate. Prof. Richman asked participants to keep comments as concise and precise as possible, and to take no longer than two minutes each.

Prof. Boudreau (HUA) asked what faculty members could do to help students who had not shown signs of distress but were waiting for an appointment with an SDCC counselor. **Dir. Morse** suggested encouraging them to be patient and encouraging them to indicate clearly to the SDCC if their needs are urgent.

Prof. Sanbonmatsu (HUA) appreciates all the hard work that administrators and counselors have been doing for our students over the years, but he believes that three student suicides at WPI in three months represents institutional failure at multiple levels in our university, including some fault on the part of faculty. He feels shame that he has not done more in his 18 years at WPI and has been deeply concerned both about the emotional wellbeing of our students and about the way WPI handles mental health. He has no ill will at all towards anyone as an individual, but he does perceive a pattern of student neglect and a lack of creativity in meeting student challenges. He gave two examples that he felt illustrated these failings. Prof. Sanbonmatsu also indicated that In November of 2020 he met with several administrators on our campus and drew up several action items to improve student mental health. These items included: 1) making faculty more aware of student stress and depression, and giving faculty more tools for addressing stress and depression; 2) providing faculty with the contents of recent reports to the Board of Trustees concerning student mental health; 3) devising a student survey about their experience concerning COVID and workloads; 4) initiating community building including having students pair up in a buddy system to check in with each other; and 5) having a mandatory campus wide public discussion of these issues. Prof. Sanbonmatsu does not question the compassion of intentions of the senior administrators with whom he met. However, he observed that there was no follow-up and there were no changes in policy after these discussions. Prof. Sanbonmatsu is sincerely grateful to President Leshin for extending the A/B term break, but he pointed out that members of the faculty had raised the issue of the emotional toll of truncated breaks on our students more than once in the past year. Prof. Sanbonmatsu reported that none of the 25 students in his current course knew how to access SDCC resources. He urged CASL to make sure that the review ordered by Pres. Leshin of our student mental health infrastructure be an wide-ranging external review of the highest quality, independent of the administration and the president's task force. Finally, he urged CASL every year to conduct comprehensive qualitative surveys of student experience across all departments and programs, including of the counseling center and student affairs.

Prof. Nephew (BBT) asked if there were any other similar clusters among students at other schools returning to campus after the pandemic. **Dir. Morse** has not heard of such clusters but has heard that there have been increased reports of suicides on other campuses.

Mr. Bergstrom (Op. Manag. MFE Labs) pointed out that our students are typically very high achievers and may not be open about their feelings. As a result, they won't necessarily identify their distress to us. In response, he has shared his own personal past struggles in an attempt to encourage his students to reach out to him.

Prof. Rodriguez (SSPS) thought that despite the immediate emergency, we need a culture shift that emphasizes ongoing mental health and wellbeing as a community priority. She suggested two things that faculty could do in their classes. The first is to let our students know we care by using mid-course surveys to ask them how we can support them in this class or in general. Occasionally a student will admit to struggling, and we can create a plan of action from there. The second is, despite our timelines and deadlines, to occasionally modify the agenda of a meeting to ask each student how they are feeling.

Prof. LePage (CEE) has heard from her students that, as part of their grief, they are mad at the isolation caused by the COVID restrictions. She would like to eliminate the requirement to wear masks in the classrooms. While she understands indoor protocols, she cannot recognize her students let alone their distress. **President Leshin** explained that the only restrictions on students are requiring masks indoors, regular testing, and a few minor adjustments to campus events. President Leshin added that the classroom mask mandate is in effect to protect the faculty. She hopes to reopen the discussion about masks after vaccinations for 5- to 12-year-old children are approved.

Prof. deWinter (HUA) observed that the whole campus has leaned heavily into a "meeting culture," which leaves less time for faculty members to meet with their students. One option is to rethink workloads that keep us away from our students. Prof. deWinter was worried about burnout and depression among the faculty even before COVID, and now we are asking those strained faculty members to help our strained students. She also pointed out that our graduate students share some of the stresses of faculty members and some of the stresses of our undergraduates: they worry about faculty members getting grants to support them; and they worry that they have to come to campus when others are not required to do so. Prof. deWinter wanted us to be sensitive to all the different stresses on all our different communities.

Prof. Fehribach (MA) was in favor of eliminating the mask mandate because of the obstacles it creates in communicating with our students. He also understood the need to balance these considerations against the increased risks of spreading COVID. For the moment, he was reassured by the low number of COVID cases on campus.

Prof. Reidinger (BME) felt strongly that the mask mandate should remain in effect. On a larger point, the sense she is getting from her students is that faculty members vary widely in the flexibility they are providing for their students. She observed that students confronted with less flexible professors tend to go for support to those who are more flexible. In addition, our general efforts to proceed as though circumstances are close to normal make those who are struggling feel abnormal. In Prof. Reidinger's view, faculty members should keep in mind that the campus stresses are due both to campus culture and to the choices that are being made in individual classrooms. **Prof. Barton** added that the complications of offering flexible courses are more than compensated by the appreciation and alleviation of stress felt by the students.

Prof. Samson (HUA) observed that individual students send email to us to share their difficulties, which oftentimes amount simply to requests to extend deadlines. However, even after further prodding on our part, when those students say they are otherwise doing okay, it does not mean that they are not reaching out to somebody else for additional needed support. So it is important that their professors tell them that it is perfectly okay to get help wherever they need it.

Prof. Sakulich (CEE) pointed out that while he is being as flexible as possible in his classes – typically of 50 students or more – it is not possible for him to tell if any of them are in trouble. In his view, people are overestimating his abilities to keep track of his students' mental health. **Prof. Barton** agreed that methods that work in one setting, such as in a 12-person humanities practicum, will probably not work in a 125-person lecture course, and that is the challenge we have to overcome.

Prof. Chery (IMGD) thought that as hard as he has been working during COVID and as difficult as it has been for him personally, he does not think he has been working as hard as our undergraduate students. They are expected to spend about 45 hours per week on academic work, which does not include time spent working outside of school. As an instructor, he would like the option of making his courses pass/fail rather than relying on the students to choose the option. In the meantime, he is managing as well as possible by giving his students as much leeway with grade deadlines as possible.

Prof. Boudreau (HUA) pointed out that we implemented a pass/fail option for students last year as a temporary measure due to COVID. But students, such as those applying to medical schools, have their reasons for preferring letter grades. She added that the mental health problems we are seeing in our students may be due to non-COVID causes, such as the prevalence of social media, and it looks like those problems will outlast COVID. This means that we may need to reconsider offering the pass/fail option beyond as a temporary measure.

Prof. El-Korchi (CEE) explained that beyond the need to be flexible, we need to be sympathetic to our colleagues who are challenged by large classes and shrinking resources. He urged us also to be compassionate amongst ourselves and not judge each other harshly. He emphasized that the purpose of this forum is to hear creative ways to be flexible, and he urged people to offer specific, actionable recommendations.

Prof. Smith (CS) was struck by how much we have scheduled for ourselves and how the campus has been operating as though normal life must go on. She suggested instead that to make time for our own needs and for those of our students, we need to cancel the activities that don't matter in dealing with the current crisis. She reflected on how sad it was that we are struggling with finding time to be compassionate people.

Dean. McNeill (Eng.) explained that many of the discussions in CERT are about the mental health of faculty, staff and students. He suggested that our primary role as faculty is to model appropriate behavior by both what we teach and how we teach it. So, as a matter of demonstrating our priorities, it is okay in our courses not to cover all the material on the syllabus.

Prof. DiMassa (HUA) thought that the challenges of offering flexibility can be reduced if it is built into how we design our courses with realistic expectations at the outset. He expressed concern about courses that are well known to monopolize students' time and lives in taking 40 to 50 hours per week for each student. Students tell him that his courses serve as their self-care routine, which is heartening, but in turn makes it difficult to push them when needed. **Prof. Barton** added that we do

not have institutional knowledge about how much academic work our students are doing each week, and he suggested that we should.

Prof. LePage (CEE) agreed that we should be flexible beyond the special circumstances of COVID. She explains to her students that the published deadlines on Canvas are provided only so students can plan their time and the deadlines also help Prof. LePage manage her load. She never penalizes her students for late assignments and has not had students abuse the policy.

Prof. Shue (CS), as an instructor of a time intensive course, indicated that in response to student feedback that they are overworked, he removed a project that had initially been required for the course. He believes that the trade-offs were worthwhile and encouraged others to temper their enthusiasm for perhaps expecting too much.

Prof. Chery (IMGD) indicated that he checks workload expectations by taking his own courses before publishing them on Canvas and expects his students to need twice as much time as he does. His concrete solution is to “be the student.”

Prof. Clark (ECE) asked if the academic calendar of four seven-week terms contributes to student stress. Final exam times create peaks of stress and due to the seven-week term schedule, our students have more of them than their peers at other schools. The term system also makes it more difficult for students to catch up if they miss even just a few days of class.

Prof. Yarbrough (IMGD) observed that short of intervening with students when they are experiencing a crisis, he did not know of a mechanism for raising milder concerns that may prevent a crisis later. **President Leshin** indicated that there is a web form through the Dean of Students Office that faculty members can fill out that goes to the counseling care team to determine the best response. **Dir. Morse** explained that this allows the team to formulate the best strategy for the student.

Prof. O'Donnell (CS) asked about the degree of confidentiality assured by the web form used to report concerns about students. **Dir. Morse** explained that communications with the SDCC about students and with students are confidential. Sending the web form alerts more members of the care team to the concerns raised. **Paul Reilly** (Asst. Dean Student Success) indicated that for academic issues, parents are consulted if the belief is that they will serve as effective advocates and can support the student.

Prof. Barton reiterated that CASL's intention is to digest the information shared at this meeting and continue to work with the appropriate groups on campus to address the concerns raised. He encouraged all in attendance to contact him with any further thoughts.

President Leshin thanked the faculty for expressing its concerns and sharing their strategies. She expressed her gratitude to the faculty, who despite their fatigue, remain on the front line with our students, and she described the importance to our students of the faculty's deep concern for them. President Leshin described the faculty/staff/student task force that has been constituted to address community wellbeing and thanked the task force members. They have been asked to consider how to engage the WPI community in a conversation about an ongoing wellness approach to mental health. President Leshin has asked the task force to think about additional wellness programming, academic opportunities, new courses, cultural changes, and other tools for students, staff, and faculty. She was also interested in leveraging technology to help solve problems. The task force will be providing short-term recommendations by the beginning of B-term and longer-term recommendations by winter break. WPI is also working with Riverside Trauma Center to organize an external review of our mental health infrastructure. President Leshin indicated that in the near term, the SDCC will be augmented as needed, and as an ongoing effort she looked forward to the continued collaboration with the faculty and all members of the community. She concluded by expressing special appreciation to Dir. Morse and the SDCC team.

Prof. Richman summarized the suggestions at this meeting as falling into one of two categories: those that might involve only relatively minor changes to what we already do in our classes and projects; and those that involve systemic and cultural changes that would be more difficult. He also suggested that we distinguish problems that have arisen specifically due to COVID from those that are now apparent but had preceded COVID. In closing, Prof. Richman emphasized that sharing thoughts such as those expressed today should not be limited to this meeting, and he encouraged all those in attendance to communicate further with CASL, other governance committees, the SDCC, and the task force on community wellbeing.

3. Adjournment

Meeting was adjourned at 4:40pm by Prof. Richman.

Respectfully submitted,

Mark Richman
Secretary of the Faculty

Addendum on file with these minutes:

1. Addendum #1 - CASL Outline of Discussion on Student Mental Health - Minutes 9-30-21

WORCESTER POLYTECHNIC INSTITUTE
Faculty Meeting Minutes
October 7, 2021

Summary:

1. Call to Order
 - Approval of Agenda
 - Approval of the Consent Agenda and Minutes from September 2, 2021
2. Committee Business: COG
3. Special Report from the Admissions Office
4. Committee Report: FAP
5. Brief Reports
 - Faculty Group: Working on Workday (WoW) to focus on academic capabilities
 - Update on WPI's masking policy
6. President's Report
7. Provost's Report
8. Closing Announcements
9. Adjournment

Detail:

1. Call to Order

The third Faculty Meeting of the 2021-2022 academic year was called to order at 3:15pm via ZOOM by **Prof. Richman** (AE). The agenda was approved as amended to add an update on WPI's updated mask policy. The minutes from September 2nd were approved as distributed.

Prof. Richman thanked the Committee Chairs and members of COG for helping decide to conduct this meeting remotely. The goal is still to return to in-person meetings because of the strength and uniqueness of our faculty community in coming together across departments, programs, and schools each month. As a general matter, these intangible benefits need to be weighed against the advantages - including convenience - of remote meetings. For this meeting, we responded in the short term to concerns such as those raised at our Sept. 30 meeting about reducing complexities for attendees. In the long term, the question will be whether a new remote normal would really be a better normal. Prof. Richman added that he welcomes input on this matter.

2. Committee Business

Prof. Richman pointed out that the following two motions to rename two departments appear to be simple, but each represents significant changes, growth, and evolution of our core academic departments.

COG

Prof. El-Korchi (CEE), on behalf of the Committee on Governance, moved that the Mechanical Engineering (ME) Department be renamed as the Mechanical and Materials Engineering (MME) Department.

Prof. Yagoobi (Dept. Head, ME) explained that the name change had been endorsed by the ME faculty and the ME advisory board, and that the change was timely because the Aerospace Department has now separated from the Mechanical Engineering department. The Mechanical Engineering department offers a bachelor's degree program with 930 current students. At the graduate level, the department offers four master's programs (with 238 students) and three Ph.D. programs (with 95 students). The department's external research funding is over \$11 million. The name change better reflects its core mission and will bring significant visibility to the materials engineering program. To avoid confusion with the Master's in Mathematics Education (MME) program, all courses in mechanical engineering, including those in materials and manufacturing, will share the ME prefix. (See Addendum #1 on file with these minutes.) **The motion passed.**

COG

Prof. El-Korchi (CEE), on behalf of the Committee on Governance, moved that the Department of Civil & Environmental Engineering (CEE) be renamed as the Department of Civil, Environmental, and Architectural Engineering (CEAE). As Department Head when the Architectural Engineering program at WPI was founded, Prof. El-Korchi was especially gratified to see how the program has grown to this point.

Prof. Eggleston (Dept. Head, CEE) reported that the CEE department currently has 12 tenure-track faculty and three TRT faculty members, with about 375 undergraduate students. The proposal would finally include all three of the department's ABET accredited programs in its new name, and it would provide increased visibility to our architectural engineering program. Prof. Eggleston explained that the practice of architectural engineering has become fundamentally entwined with its environmental implications. He cited as a prominent recent example of this phenomenon, WPI's participation in the 2019 Solar Decathlon Africa competition in which our architectural and environmental engineering students' uniquely design won the award for most comfortable structure. The architectural engineering program is now comparable in size to the environmental engineering program, and the department's research expenditures were up 23 percent last year, in large part due to the activities of the architectural engineering faculty. (See Addendum #2 on file with these minutes.) **The motion passed.**

3. Special Report from the Admissions Office

Prof. Richman explained that the report to be given from the admissions office concerning admissions and financial aid policies will dovetail nicely with the report to follow from FAP regarding resource allocation in response to this fall's unexpectedly large first-year class.

VP Palumbo (Enrollment Management) presented information on the COVID impacts of the college search process, provided updates on the classes of 2025 and 2026, reviewed historical admissions data over the past five years, and gave an indication of future enrollment goals. In the class of 2025, women increased from 35 to 43 percent, under-represented students of color increased from 13 to 14 percent, and WPI was among the 32 percent of all colleges to fill its first-year class by May 1. Our first-year class of 1417 students exceeded our goal of 1335, and our full-time undergraduate enrollment is 4956 students. We are studying why we exceeded our first-year target, including why the summer 2021 melt rate of 5.2 percent was so much lower than the 9 percent that we anticipated. VP Palumbo explained that COVID continues to affect our recruiting efforts and we are making necessary adjustments by eliminating the application fee, continuing a second year of binding early decisions, instituting a test blind admission policy, and augmenting our virtual recruitment efforts. Historical admissions data indicates that our admission rate has increased significantly from 49.3 percent in 2019 to 59.0 in 2020 and to 60.0 percent in 2021. The net cost to attend WPI has decreased from \$49,050 in 2020 to \$48,004 in 2021, although it still exceeds our benchmark group's net cost by \$5,000 per year. Our goal is to make WPI more affordable, and to increase the diversity of our student body. (See Addendum #3 on file with these minutes.)

Prof. Danielski (HUA) asked if we are doing anything to increase the number of international undergraduates, which have decreased in the last few years. **VP Palumbo** indicated that we have increased our staff and international travel in the last few years, we offer financial aid to our foreign students, and during COVID we supported our current international students by offering an on-line option.

Prof. Fehribach (MA) asked if the intention was to readjust the admission rate back down to around 50 percent after COVID. VP Palumbo expected the rate to come down considerably next year as the uncertainties from COVID subside.

Prof. Rudolph (HUA) asked why there was a \$1,500 drop in WPI's net cost from 2017 to 2018 unrelated to WPI Forward, which was actually larger than the drop from 2020 to 2021. **VP Palumbo** explained that the larger decrease in net cost was due to better than normal financial aid packages offered that year. That approach led to a higher yield rate but was not sustainable.

Prof. Pavlov (SSPS) was concerned about our high discount rate (47 percent) because he understood that high discount rates often signify pending financial failures. **VP Palumbo** pointed out that our discount rate is lower than that of our peers, which explains in part why our net cost is higher. The average discount rate nationally has been over 50 percent for some time, and we have typically been below the average for at least the last six years. **President Leshin** added that we increased our discount rate to be more competitive with our peers and to attract the type of class we want - rather than because we could not fill our class otherwise.

4. Committee Report

FAP

Prof. Fehribach explained that the total tuition revenue generated by the larger than expected incoming class (82 students above the target of 1335) was \$2,165,530, from which a FY 2022 supplemental budget for academic affairs of \$947,888 has been allocated as follows: \$345,000 for adjuncts and overloads; \$116,480 for GLAs and PLAs; \$193,200 for TA tuition; \$143,208 for TA stipends; \$100,000 for consumables and supplies; and \$50,000 for academic advising. These funds have gone to the departments most affected, particularly in Arts and Sciences. Prof. Fehribach concluded by making the point that the \$947,888 allocated to academic affairs was 44 percent of the extra tuition revenue generated. (See Addendum #4 on file with these minutes.)

President Leshin pointed out that after the final enrollment figure is known, the supplemental revenue allocated to academic affairs might amount to about half of the additional tuition revenue generated, and that discussions with the Provost were ongoing about additional needs that might arise.

Prof. Demetry (ME) was concerned that, despite the pride faculty members at WPI take in advising their own students, the caseloads of our professional advisors for academic advising are extremely high. She hoped that the additional needs that are being considered also include an assessment of the number of professional advisors that we have in the academic advising office.

Prof. Smith (IMGD) asked what the process was for allocating the supplemental revenues described by Prof. Fehribach. She was concerned that decisions about allocation might have been made before input from program directors and department heads had been fully considered. **Prof. Fehribach** explained that these are administrative decisions that had to be made fairly quickly because we did not know that we would have additional students until late in the summer. Requests for additional resources go to program directors, department heads and deans, particularly Dean Heinricher because the additional students are in their first year.

Prof. Ryder (BCB) asked if the allocations made were for the whole academic year or if it is anticipated that more funds will be allocated throughout the year. **AVP Sullivan** (Acad. Affairs) clarified that all the revenues described have been received by academic affairs but have not been fully allocated, with an allocation scheme in progress. The money is anticipated to be allocated throughout the whole year and expected to augment the budgets that are already in place. He is working with the deans based on their departmental requests. AVP Sullivan also pointed out that this is a four-year allocation that will shift as this year's first-year students progress through their studies and as the demands placed on different course and programs change.

Prof. Boudreau (HUA) recalled that as a Department Head in 2017-18 when the discount rate was higher than in previous years and the incoming class was unexpectedly much higher than WPI had ever seen, Department Heads and the Dean of Undergraduate Studies worked hard through the summer to identify the resources needed to accommodate the incoming class. In the end, despite assurances from the President that these resources would be provided, the funding to cover classes was inadequate. Today, with another large class, Prof. Boudreau urged the administration to use the entirety of the additional tuition revenue from this large class for instruction and student support, which was inadequate even before this year. Prof. Boudreau expressed her concern that the mismatch between large student populations and limited resources for instruction and student support (academic advising, TAs, student counseling, and so on) is a significant factor in the additional stresses on faculty and staff and in our inability to respond to student distress. To illustrate the point, Prof. Boudreau noted that Prof. Heineman, who takes the time to learn the names of every student in his large lecture courses and is the most student-centric instructor she knows, revealed at the memorial for our most recent student, Jin Godin, to die by suicide that he was Jin's academic advisor but had never met them. Something is wrong, not with our overworked faculty, but with our processes and resources if we have allowed this to happen. **Prof. Fehribach** agreed with those sentiments.

AVP Sullivan (Acad. Affairs) noted that there was a specific line item of \$50,00 that has been allocated directly to the advising office. As the university is preparing its long-term financial plan, the concern about advising has been raised. Mr. Sullivan has collected information from Paul Riley on the ratio of students to advisors and agrees that we need to provide some support.

As the student body continues to grow, we need to increase the resources that for instruction, academic advising, and general well-being. Discussions are ongoing to make sure that resources are in place.

Prof. Rudolph (HUA) pointed out that last fall's first-year students, who did not have a typical experience and were very isolated, might struggle more than others with mental health. She hoped that we would devote significant resources and time on that group, as well. **Prof. Fehribach** indicated that the administration appears committed to addressing the needs of those students. **Dean Heinricher** (UGS) added that there is a special program for returning sophomores. He also pointed out the difficulty these students have in making connections, and he stressed the importance of encouraging students to recognize that hands are reaching out to them. **President Leshin** suggested that we need different ways than through email to successfully reach these students and that there may be automated methods to engage students in which technology can serve as an additional set of tools for us.

Prof. Richman observed that a significant fraction of the supplemental budget from the oversized class appears to have been allocated to address needs that had little to do with the unexpectedly large first-year class. He asked how we can sort out the shortages in academic resources that were already present before this year from those that were directly related to the size of the incoming class. **Provost Soboyejo** explained that the existing academic needs were addressed this summer in consultation with the deans, department heads, and program directors. A second process was put in place based on the additional needs of the larger class, and he indicated that President Leshin encouraged us to further increase these requests. **Prof. Richman** asked for clarity that the supplemental budget had been allocated to do more than just to compensate for the larger class, but also to address other existing deficiencies. **Provost Soboyejo** confirmed that was the case.

5. Brief Reports

Faculty Group: Working on Workday (WoW) to focus on academic capabilities

Prof. Heineman (CS) has been serving with Prof. Cullon, Dean Heinricher, and Dean Riley as a liaison with IT to ensure that Workday serves our academic needs. The group has created an email address (WoW@wpi.edu) to which faculty members can send questions and problems related to the academic functions of Workday. The group will identify the biggest problems and forward them to the experts at Workday. The goal before degree audits must be done for graduating seniors is to resolve all important academic issues before May 2022.

Update on WPI's masking policy

Dean McNeill (Eng) presented an update based on a decision about WPI's masking policy made at yesterday's CERT meeting. Effective immediately, when public speaking in an organized campus activity, including in-person classes or lab instruction, where all others who are present are masked and at least six feet from the speaker, a fully vaccinated speaker may remove their mask while speaking. This applies to all speakers, including students. (See Addendum #5 on file with these minutes.)

In response to a question from **Prof. Fehribach** (MA), Dean McNeill clarified that if there are two instructors in the classroom, only the speaker should be unmasked at any time.

Prof. Wills (CS) was concerned some students may be uncomfortable with this change. Dean McNeill thought that the comfort level of the students should be weighed by the instructor in exercising the masking/unmasking option. His sense was that most students would be in favor of the policy. **President Leshin** thought that based on the low level of our campus COVID cases, the benefits of the updated policy outweigh the risks

6. President's Report

President Leshin reported on the very positive outcome of the just concluded NECHE visit (Oct. 4-6), and she gave special thanks to Dean Heinricher and Dean Perlow for their efforts over the past two years to prepare for the visit. The Neche visitors identified our strengths as follows: 1) WPI's distinctiveness, and our project-based curriculum and the global focus; 2) WPI's student-centered approach and our student's collaboration and teamwork; 3) WPI's administrative leadership, especially as reflected in the creation of Schools and in the creation of the Administrative Policy Group (APG), its focus on DEI, and its responsible financial management, and our response to COVID; 4) WPI's creation of the teaching path to tenure, the extension of voting rights to non-tenure track faculty, the offering of longer-term contract for NTTs, and our expanded promotion criteria; and 5) WPI's well executed strategic plan with another one on the way.

The visitors identified their concerns as follows: 1) WPI's culture that sometimes puts academic achievement and innovation above the well-being of students, faculty and staff; 2) WPI's historical reliance on high net tuition, which has made us an expensive school, and WPI's relatively high level of institutional debt; 3) WPI's continued need for thoughtful consideration of enrollment growth, with care needed to provide proper staffing; 4) WPI's need to create an understanding of the roles of schools and deans; 5) their suggestion to better incorporate staff and students into a more balanced model of institutional governance; 6) WPI's lack of comprehensive internal and external assessment processes for all academic programs that should be supported by strong institutional research.

President Leshin sees the conclusions of the NECHE visitors as providing good opportunities for WPI over the next ten years. She closed by thanking the whole WPI community for its participation and engagement.

7. Provost's Report

Provost Soboyejo reflected on his feeling that after five years at WPI, he still feels as though he is in a honeymoon period. He is thankful for his colleagues' zeal for the common good. Today's votes to change the names of two long standing departments are signs of a progressive faculty-driven evolution that is gradually transforming the university. He is excited about the ideas behind the next strategic plan: to make WPI more affordable and accessible; to conduct purpose-driven research; and to aspire to the goals of diversity and inclusion. Provost Soboyejo looks forward to taking all the input that has been received and working with the strategic plan implementation team. He invited the faculty to have a drink in a social hour on October 18th at 4pm at Higgins House. Provost Soboyejo closed by thanking faculty governance, the staff, and administrators who have made WPI a special place.

8. Closing Announcements

Prof. Heineman (CS) assured everyone that emails that go to the wow@wpi.edu alias will just go to him, and he will share the concerns with the committee only after they are made anonymous. He wanted to encourage use of the alias and hoped his assurance would reduce the fears of users of Workday who do not have job security.

9. Adjournment

The meeting was adjourned at 5:00pm by **Prof. Richman**.

Respectfully submitted,

Mark Richman
Secretary of the Faculty

Addenda on file with these minutes:

1. Addendum #1 - Presentation for Dept Name Change from ME to MME - Minutes 10-7-21
2. Addendum #2 - Presentation for Dept Name Change from CEE to CEAE - Minutes 10-7-21
3. Addendum #3 - Admissions Update - Minutes 10-7-21
4. Addendum #4 - FAP Presentation on Additional Resources for the 2021 Incoming Class - Minutes 10-7-21
5. Addendum #5 - CERT Update on WPI Masking Policy - Minutes 10-7-21

Date: December 2, 2021

To: WPI Faculty

From: Committee on Academic Operations (Prof. Titova, Chair)

Re: Motion to approve the December 2021 undergraduate student graduation list

Motion: The Office of the Registrar reports that the following candidates have either completed all the requirements for the degree designated in the department or program indicated or are expected to complete their degree requirements before December 30, 2021. They therefore are or will be eligible to receive that degree, and on behalf of the Committee on Academic Operations, I move that – pending final verification by the Registrar that all those on the list have in fact completed their degree requirements – they be approved for December 30, 2021 graduation.

Bachelor of Arts

Environmental and Sustainability Studies:

Isabela J. Chachapoyas Ortiz
Minor: Spanish

Interactive Media and Game Development:

Aidan L. Sensiba
Minor: Computer Science
Dylan A. Valev
Concentration in Technical Art
Minor: Computer Science

Bachelor of Science

Actuarial Mathematics:

Wenrui Zheng
Minor: Data Science

Aerospace Engineering:

Robert Steele Connor III
Gracie Lodge-McIntire
Rushab D. Patil
Double Major
William J. Rollins
Christian Maximilian Schrader
Minor: Computer Science
Dieter Teirlinck

Applied Physics:

Alexandra Rose Pleuntje de Heer

Architectural Engineering:

Julia Jacqueline Pope
Maura Anne Walsh
Minor: Business

Biochemistry:

Ulises Armando Cardona Pamplona

Biology and Biotechnology:

Jagruthi Maroju
Justin John Polcari
Double Major
Minor: Chemistry
Alexis Margaret Rock
Minor: Psychology
Sarah Kimball Tarantino

Business:

Olivia Wood Reneson
Concentration in General Business

Chemistry:

Elina Aune Barrows
Mohammed Mohammed
Double Major

Civil Engineering:

Ryan W. Menard

Computer Science:

Parker Bowen Reyes Coady
Joseph Cybul
Double Major

Computer Science cont.:

Nour Elmaliki
Concentration in Cyber Security
John Christopher Faria
Concentration in Cyber Security
Jenna E. Galli
Minor: Business
Fan Gong
Minor: Mathematics
Timothy K. Goon
Evan Alexander Hatton
Muyun He
Minor: Robotics Engineering
Alex M Hunt
Double Major
Tyler Warner Jones
Stefano Jordhani
Shundong Li
Mingxi Liu
Concentration in Cyber Security
Minor: Psychology
Stephen Robert Lucas
Zhifei Ma
Double Major
Amelia Nishimura
Double Major
Baian Ou
Victoria Joy Thornton
Beinan Wang
Minor: Mathematics
Minor: Mathematics

Electrical and Computer Engineering:

Samantha Marie Boyea
Nisha Goel
Minor: Computer Science
Swan Htet
Mitchell Jacobs
Trevor James Karrett
Sizhuo Li
Ngoga Julien Vainqueur Mugabo
Stephen Natale
Brendan Andrew Russell
Luis David Sanchez Martinez
Brendan Michael Train

Emma Elizabeth Williams
Brandon F. Winn
Gwyneth Marcelina Uminga Zelmanow
Double Major

Environmental Engineering:

Maia Elizabeth Gifford

Industrial Engineering:

Spencer M. McClellan

Interactive Media and Game Development Technology:

Alex M Hunt
Double Major
Tyler Sprowl

International and Global Studies:

Mohammed Mohammed
Double Major

Management Engineering:

Mustafa John Eracar
Concentration in Mechanical Engineering
Valentina J. Harrison
Concentration in Electrical and Computer Engineering
David Michael Hinckley, Jr.
Concentration in Civil Engineering
Vignesh Vasudevarao Kadarabad
Concentration in Electrical and Computer Engineering

Management Information Systems:

Lucas F. Fernandes

Mathematical Sciences:

Kwabena A. Adwetewa-Badu
Mitchell Richard Burns
Zhifei Ma
Double Major
Ethan Francis Washock
Double Major

Mechanical Engineering:

Jacqueline Reed Aaron
Yu Him Michael Au
Kemal Cakkol
Concentration in Manufacturing
Yen-Chen Chen
Tony George Eid
Timothy Ean Giddings
Eric Conrad Heiman
Du Lou
Minor: Mathematics
Chloe Elsie Melville
Concentration in Biomechanical
Abigail J. O'Sullivan
Minor: Business
Zachary John Palanchian
Concentration in Mechanical Design
Adam Robert Rodeen
Jax Riley Sprague
Kaitlin Rose Tripi
Concentration in Mechanical Design
Tyler Nathan Vu
Zebang Zhang

Physics:

Eric Anthony Lopes
Amelia Nishimura
Double Major
Ethan Francis Washock
Double Major
Gwyneth Marcelina Uminga Zelmanow
Double Major

Professional Writing:

Justin John Polcari
Double Major
Minor: Chemistry

Psychological Science:

Dalila I. Jarvis

Robotics Engineering:

Joseph Cybul
Double Major
Rushab D. Patil
Double Major

Date: December 2, 2021

To: WPI Faculty

From: Committee on Graduate Studies and Research (Prof. Korkin, Chair)

Re: Motion to approve the December 2021 graduate student graduation list

Motion: The Office of the Registrar reports that the following candidates have either completed all the requirements for the degree designated in the department or program indicated or are expected to complete their degree requirements before December 30, 2021. They therefore are or will be eligible to receive that degree, and on behalf of the Committee on Graduate Studies and Research, I move that – pending final verification by the Registrar that all those on the list have in fact completed their degree requirements - they be approved for December 30, 2021 graduation.

Doctor of Philosophy

Biochemistry:

Chelsea Anne Barr

Business Administration:

Prateek Jain

Chemical Engineering:

Ziyang Zhang

Computer Science:

Xin Dai

Yu Liu

Data Science:

Nitish Bahadur

Thomas Wiliam Hartvigsen

Guojun Wu

Liang Zhang

Electrical and Computer Engineering:

Lin Bai

Yasmina Benkhoul

Raunak Mukund Borwankar

Ian Matthew Costanzo

Yecheng Lyu

Kyle William McClintick

Devdip Sen

Yiming Zhao

Fire Protection Engineering:

Li Chang

Veronica M. Kimmerly

Xiaoyue Pi

Materials Science and Engineering:

Farzaneh Farhadi

Audrey M. Jean Philippe

Vanessa Obiageli Uzonwanne

Xiangbin Wang

Mechanical Engineering:

Ashley Hungya Chu

Haimi Tang

Mengqiao Yang

Robotics Engineering:

Lening Li

Statistics:

Xinyu Chen

Systems Engineering:

Rahul Krishnan

Master of Business Administration

Mushtaq Ahmed

Eli E. Alvarez

Kenneth B. Amaral

MacKenzie Elizabeth Brandes

Michael G. Clark

Andrew David Doucette

Timothy John Ellsworth

Gregory William Farrell

Santiago Fernandez Moreno

Tyler Joseph Gibbs

Casey Robert Godzyk

MBA cont.

Lauren Olivia Gonynor
Matthew Whitmore Greenough
Emily Anne Hickey
Ian W. Jolin
Srinivas Reddy Julakanti
Aaron Edward Kelley
Devon Z. Kovaci
Kelsey Ann Lamoureux
Andrew H. Lubin
Raffi Ohannes Mangoyan
Courtney Dyan Murphy
Brianna Marie Newton
Anthony Michael Orfitelli
Evan Steven Paskalis
Harold F. Reader III
Tyler Jason Roth
Gentian Rudho
Theona Kalikolehua Pao Scola
Michael James Wheaton
Julia Halannah White
Jonathan Jerome Zwirko

Master of Engineering

Biomedical Engineering:

Fabian Eduardo Bonilla Sabillon
Alyssa J. Sousa
Talia L. Vaughn

Electrical and Computer Engineering:

Bowen Han
Kevin J. Huang
Evan A. Magno

Power Systems Engineering:

Blaine L. Baker
Joseph Scott Bartenstein
Ronita Bose
Vienna Luna Bowen
Andrew Francis Flynn
Benjamin Alexander Franco
Benjamin Grace

Brandon M. Lopes
Brian Frederick Majerowicz
William Daniel McGugan
Neal Francis Stacom
Alexander E. Sullivan

Master of Science

Aerospace Engineering:

Rebecca Claire Debski
Jessica Elisabeth Holland
Alexander D. Klenk
Caroline Ann Kuhnle
Chin Ngai Mike Lam
Elijah Benjamin Levi
Sydney Elizabeth Messey
Allison Leigh Robotzek
Nathaniel Gregory Rutkowski
Kamyar Sajjadi
Theresa Anne Sandbrook
Jack Graham Tulloch

Applied Statistics:

David Anthony Cavallaro, Jr.

Bioinformatics and Computational Biology:

Michael L. Corace

Biomedical Engineering:

Paige Elise O'Gorman

Bioscience Management:

Mustaf Dhere Abdulkadir
Paulina N. Andzie-Quainoo
Luis Ariel Avila
Andres Felipe Berrio
Ronn C. Gerra
Andrene Gordon
Susan Guerette
David Felipe Gutierrez Varon
Patrick Jarred Knapp
Jessica M. Lievre
Marci Murray
Caroline Nelson
Sherman Jafri Peoples

Bioscience Management cont.:

Jessica A. Poisson
Andrew Thomas Roberts
Ashley L. Roulx
Megan Joanna Sogard
Victor WingTai Szeto
Paul Edward Wasserzieher
Benjamin Joseph Weirich
Jason F. Wentworth

Biotechnology:

Nicholas Christopher Brock
Elizabeth A. Ebitson
Hieu Trung La
Monica Maria Lence
Christopher Angevine McGillicuddy
Hammed Opeyemi Oseni
Katerina Pela
Daniel Adam Terry
Christopher Lealand Welsh

Business Analytics:

Zehua Chen
Jiahui Fan
Jie Hu
Chenguang Wang

Chemical Engineering:

Katherine E. Amrein
Ryan C Bowe
Connor M. Buek
Nicholas Whitney Fleury
Jacob Edward Goodwin
Eric Thomas Himebaugh
Katy Elizabeth Jessop
Concentration in Environmental
Minor: Sustainability Engineering
Shelby Page Morrison
Matthew P. Rando
Trey C. Sheridan
Yuhan Yang

Civil Engineering:

Bruno Barros Scherrer

Computer Science:

Justin William Aquilante
John Stanley Bernard
William Scott Campbell
Michael J. Clements
Janette Lee Fong
Elie Menachem Hess
Noble M.F. Kalish
Zilin Li
Baixin Liu
Isabel Morales Sirgo
Jean-Philippe Anthony Pierre
Tyler Helmut Reiser
Yunyao Wu
Iilir Zela
Yunyun Zhang

Data Science:

Marwan Abdullah H. Alsaedi
Daniel Sergei Cher
Imogen Cleaver-Stigum
Karthikeyan Deiveegarajan
Adam Joseph DiChiara
Prathyush Parvatharaju
Aishwarya Ramakrishnan
Mircalin Samedy
Kezban M. Sunar
Scott Wing Tang
Shijing Yang
Yu Zhai
Xiaofeng Zhang

Electrical and Computer Engineering:

Sideris Angelou
Aatreya Chakravarti
William Anthony Crafa
Matthew P. DiPlacido
Dun Dun
Christian J. Emerson
Austin Joshua Hartshorn
Imam Hasan Imran
Brandt James Lomen
Serena Marie Raso
Oleksandr Semenov
Myo Min Thein
Xinyuan Simon Zhang

Environmental Engineering:

Abigail Lyn Brakenwagen
Bryan Joseph Sadowski

Fire Protection Engineering:

Frederick Mallory Brokaw
Christopher Lee Cyr
Weixuan Gong
Maiya Joycelynn Mitchell
Dylan Parrow
Jake Connor Smith
Kyle Patrick Wood
Jonathan Zimak

Industrial Mathematics:

Timothy George Day

Information Technology:

Akshata Anil Karekar

Innovation with User Experience:

Mark Polonskiy
Abdah A. St. Fleur

**Interactive Media and Game
Development:**

Josiah Daniel Boucher
Chinmay Pai
Richard Quy Phan

Management:

Ellen Abayo
Lindsey Mae Giorgi
Oliver David Hasson
Jenna Rose Hirshfeld
Michael A. Ilic
Alana Noreen Keating
Dennis J. Leary
Kyle M. Pacheco
Sebastian N. Royo
Amanda Marie Wetmore

Manufacturing Engineering:

Stanley T. Kareta
Steven A. Pickering
Michael Patrick Wilkinson

Materials Process Engineering:

Christopher G. Clark
Alyssa V. Denno

Materials Science and Engineering:

Mattea Elizabeth Gravina
Steven Matthew Jacek
Eva Rose Piazza
Kara P. Upton

Mechanical Engineering:

Walid M. Alomari
Justin Barnes
Lorenzo Bilbao
Andrew C. Black
Shadd A. Bradshaw
Federico Jose Caba
Kyle Glendon Carmichael
Yen-Chen Chen
Michael Nathan Cross
Rajkumar Sherring Dandekar
Andrew M. Dick
Minh-Chau Dang Doan
Louis Patrick Duh
Calvin Matthew Earp
Eric C. Gendron
Jaryd Ian Hobbs
Nicholas Richard Houghton
Jackson David Johnson
Samantha Elizabeth Kelly
Thomas J. Killen
Agafiya Konnova
Grant Morgan Lella
Yingbing Lu
Chloe Elsie Melville
Ryan D. Michaud
Kirsten Elaine Muirhead
Aaron John Pepin
Katherine Louise Ralph
Daniel Rene Seeley
Jax Riley Sprague
Kyle Drew Trube
Derrick Armand Walker
Matthew Anthony Walsh
John Harley Weldon

Operations Analytics and Management:

Nicholas John Aleles
Berkan Delareyna
Pavel Eroshenko
Ahmad Hassan Khan
Jake A. Needleman
Celeste Lillian Nicoletti
Evan P. Robertson

Systems Engineering (cont.)

Eric Richard Wittenmeier
Adam Robert Zak
Xiaomeng Zhou-Carr

Physics:

Eric Anthony Lopes

Robotics Engineering:

Sahawat Amonlikitsin
Peter C. Guglielmino
Spencer G. Howes
Jakub Tomasz Kaminski
Nicole L. Kuberka
Nicholas A. Longworth
Avnish Sachar
Nathan Andrew Stallings
Kehan Yang

Supply Chain Management:

Hongzhen Yu

Systems Engineering:

Man Michael Au-Yeung
Steven M. Baker
Lauren Elizabeth Xiaowen Conroy
Jonathan Charles Griffin
Jolene W. Hills
Linda Thi Hoang
Phanuphanh Jimmy Kingphilavanh
Albert V Nguyen
Rahul Ramesh Parwani
Jacqueline D. Pedo
Thomas Mitchell Pyle, Jr.
LeeAnn Bernice Loretta Raczkowski
Matthew James Simpson
Tony Lee Smith
Holden Ashby Turner
Kristen Ann Veyna
Steven R. Wall

Date: December 2, 2021

From: Committee on Academic Policy (Prof. Pavlov, Chair)

Re: Motion to adopt a policy for awarding posthumous undergraduate degrees

Motion: The Committee on Academic Policy recommends, and I move that WPI adopt the policy described below to award graduation degrees to undergraduate students who have passed away during their enrollment as students.

Description of the Proposed Policy:

We believe that any student who is enrolled at WPI will succeed. In the unfortunate event of death while enrolled in a degree-seeking program, WPI will confer a bachelor's degree in the student's name to be awarded to the student's family or other interested parties.

Procedure:

- A student passes away and a family member or other interested party initiates a request for degree conferral
- Provost or Provost-appointed delegate will:
 - Confer with family, President, and Dean of Undergraduate Studies
 - Confer with department head, program directors, and advisors as appropriate
- Dean of Undergraduate Studies approves the student to be included in the graduation voting lists with all students, representing the fact that the student was part of a larger community
- Registrar will create the diploma, with no notation of it being a posthumous degree
- Diploma is delivered in alignment with family members' requests

Rationale

In times of loss and bereavement, a clear policy of compassion guides faculty and administration in responding as a community to tragedy. Further, such a policy provides both recognition of a student and a type of closure to family and loved ones of the student.

In creating this policy, CAP opted for a clearly compassionate policy that recognizes that all students are admitted to WPI with an expectation of success. This is not without numerical data, with a 95% retention rate and high four-year completion rates. Further, WPI's strong project-based education ensures close connection between peers and between students and faculty, further supporting the student's role in the community and their success at the institution.

In recognition of this community value, the degree awarded is a regular degree, voted by the faculty in the graduation lists, rather than a posthumous degree.

Once initiated, the process can be stopped at several points due to unusual concerns or circumstances. In particular, the faculty vote is required to confer the degree.

In the following benchmarked policies, most institutions ask for a percentage of the degree to be completed before the degree is conferred. Such bean counting undermines our position of community values and dedication to success. While we are in line with the procedures outlined in these policies, we as the WPI community defer to dignity in death rather than what counts as "degree completion."

Reference Policies:

CAP considered posthumous degrees from seven schools who have posthumous degree policies posted online: Boston University, University of Maine, UMASS Dartmouth, Adelphi University, Syracuse University, Clark University, and Cal Poly. We considered the general approach, language, and processes, which informed our procedure and our approach.

University	Posted online	Minimum course requirements	Undergraduate policy	Graduate policy	Differentiated degree
Boston University	X	X (Certificate if not met)	X	X	
University of Maine	X	X	X	X	X
UMASS Dartmouth	X	X	X	X	X
Adelphi University	X	X (certificate if not met)	X	X	X
Syracuse University	X	X (certificate if not met)	X (rare and can be denied)	X (rare and can be denied)	
Clark University	X	X	X	X	X
Cal Poly	X	X (certificate if not met)	X	X	

When students were not within a certain percentage of credit completion (average 75%), the universities surveyed offered a certificate in memorandum.

Reference language concerning compassion and need:

Cal Poly:

Cal Poly has had a long history of compassionate interaction with families and friends of students who died while enrolled at the University. This compassionate interaction is in the best interest of the families and the University. The awarding of a posthumous degree has frequently brought closure to a tragic situation for the family and friends of the deceased student as well as the University. The family or other interested parties of the deceased student may initiate a request for a posthumous degree through the student's major department.

University of Massachusetts, Dartmouth:

Rationale: The University of Massachusetts Dartmouth is a caring and humane institution that takes special responsibility to recognize our students' achievements. This is especially true for students who have died. This policy is meant to make clear the University's position, avoid confusion, and empower the Colleges and Provost to award a diploma when appropriate. They are in the best situation to determine if a student has completed enough of the planned degree program to warrant granting a degree from the University of Massachusetts Dartmouth.

Implementation: Effective immediately.

Appendix
Consent Agenda Motions

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to add HI 2345 Welcome to Paradise: The U.S. and the Caribbean

Motion: On behalf of the Humanities and Arts and Department, the Committee on Academic Operation recommends and I move that HI 2345 Welcome to Paradise: The U.S. and the Caribbean, as described below, be added.

Proposed Course/Catalog Description:

HI 2345. Welcome to Paradise: the U.S. and the Caribbean. Cat I

The Caribbean has been globally imagined and described as an everlasting Garden of Eden where the land, bodies, and cultures of its inhabitants are open to be consumed in various ways and where visitors can satisfy all their desires. In addition, hurricanes and other natural disasters have made headlines around the world, casting the region as a space of inevitable doom. But there is more to the story. In fact, the relationship between the U.S. and the Caribbean reveals an even more complex narrative characterized by imperialism, racism, migrations, and geopolitical strife. Through case studies, this course will interrogate the impact of U.S. imperialist stance in the Caribbean, as well as Caribbean peoples' responses to that stance. By mapping out the many ways in which the histories of the U.S. and the Caribbean intersect, we will shape our own understanding of this relationship and assess its significance today.

Recommended background: None.

Anticipated Instructors: Professors Jeanne Essame, John Galante, William San Martín

Rationale:

This course will serve as review of the longstanding, dense, and diverse historical relationships between the nations and territories of the Caribbean and their large and hegemonic neighbor: the United States. The course content will explore entanglements among these places that were foundational to their emergence as independent states, the development of international capitalism and neo-imperial formations in the region, the formation of transnational communities due to mass migration, and other historical phenomena that continue to shape transregional interactions and exchanges between the Caribbean and the United States. Doing so will allow students of History to explore issues related to racism and geopolitics in the Americas from non-U.S.-centric perspectives, enriching existing offerings in the U.S. History sequence including HI 1313 *The U.S. and the World* and HI 2316 *Twentieth Century American Foreign Relations* while connecting to Global History courses such as HI 2913 *Capitalism and its Discontents*. This course's focus on race and the Black experience also begins to fill HUA curriculum gap in Africana Studies, and also provides critical perspectives to students seeking a minor or major in International and Global Studies or a minor in Latin American and Caribbean Studies. The expected enrollment cap is 50, and the course type is Lecture/Discussion.

Resources Needed: No new resources needed Jeanne Essame is a new full-time faculty member which specializations in History and Africana Studies. Classroom needs are typical for HUA courses. No special information technology is required. Library resources are adequate to offer this course.

Impact on Distribution Requirements and Other Courses: This course will provide additional options for students completing the Humanities and Arts Requirements, the Humanities and Arts (History) Major, the International and Global Studies Minor or Major, the Latin American and the Caribbean Studies Minor. It is also connected to emerging curricular initiatives in Africana Studies and Social Justice.

Implementation Date: Academic Year 2022-23

Contact: Joseph Cullon, Associate Head for the Humanities, Department of Humanities and Arts,
jcullon@wpi.edu

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to revise course description for HI 1313 The US and the World

Motion: On behalf of the Humanities and Arts Department, the Committee on Academic Operation recommends, and I move, that the course description for HI 1313 The US and the World be revised, as described below.

Description of Proposed Changes:

Current course description:

HI 1313. The US and the World. Cat. I

This reading and discussion course will focus on one or two topics in the history of American foreign relations, usually during the twentieth century, using a variety of primary documents and secondary sources. In recent years the course has focused on U.S. relations with the developing world after World War II, with units on U.S. interventions in Vietnam and Afghanistan. The role of science and technology as part of international development programs is a common theme. This course is excellent preparation for any of WPI's overseas project centers.

Proposed Revised course description:

HI 1313. The US and the World. Cat. I

In this introductory course, we will trace the history of the United States and the world from the late nineteenth century to the present. A global approach to U.S. history offers new perspectives on international relations, war, migration, labor, race, gender, and democracy. By exploring case studies from around the world, we will also practice crucial historical skills: asking questions about change overtime, finding evidence about the contexts of decision-making, and presenting arguments in an engaging form. This course is excellent preparation for any of WPI's international project centers.

Changes to catalog: Revise course description. No other changes needed.

Term is this course typically offered and Category: A term, Cat. I

Rationale: The new course title requires an updated description to reflect the global perspective of the course.

Resource requirements. No changes to resource requirements

Implementation Date: Academic Year 2022-23.

Contact Name: Holger Droessler (HUA)

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to change the prefix and number of HU 1412 Introduction to Asia to INTL 1200

Motion: On behalf of the International and Global Studies Program and the Humanities and Arts Department, the Committee on Academic Operation recommends and we I move that the course number and prefix for HU 1412. INTRODUCTION TO ASIA be changed to INTL 1200, as described below.

Description of Proposed Change:

Current course description and designation:

HU 1412. INTRODUCTION TO ASIA. Cat. I

This course will explore Asia through an interdisciplinary approach. We will examine tradition and modernity in some or all of four cultural regions—South Asia (India), East Asia (China), Southeast Asia (Vietnam or Thailand), Inner Asia (Tibet)—and globalization in Japan and/or Hong Kong. We will explore the cultural traditions of these various regions, paying special attention to history, religion, society. We will also consider modern developments in these same regions. The impact of colonialism, nationalism, revolution, industrialization and urbanization on the lives of Asian peoples will be illustrated through films and readings. No prior knowledge of Asian history or culture is expected.

Proposed course description and designation:

INTL 1200. INTRODUCTION TO ASIA. Cat. I

This course will explore Asia through an interdisciplinary approach. We will examine tradition and modernity in some or all of four cultural regions—South Asia (India), East Asia (China), Southeast Asia (Vietnam or Thailand), Inner Asia (Tibet)—and globalization in Japan and/or Hong Kong. We will explore the cultural traditions of these various regions, paying special attention to history, religion, society. We will also consider modern developments in these same regions. The impact of colonialism, nationalism, revolution, industrialization and urbanization on the lives of Asian peoples will be illustrated through films and readings. No prior knowledge of Asian history or culture is expected.

Students may not receive credit for HU1412 and INTL 1200.

Rationale:

This change enhances the visibility of this course for students and strengthens the coherence of our curricular offerings in International and Global Studies and area studies. It is the same course with a new number.

This motion replace HU with INTL as the course prefix. The course number accommodates the numbering system for region-based courses within the INTL curriculum, which are currently as follows:

INTL 1300 – *Introduction to Latin America*
INTL 2310 – *Modern Latin America*
INTL 2410 – *Modern Africa*
INTL 2420 – *Middle East, North Africa, and Mediterranean*
INTL 2510 – *Contemporary Europe*
INTL 2520 – *Russia Ready*

Impacts on students: None.

Resource Needs: None.

Implementation Date: Academic Year 2022-23.

Contact: Joseph Cullon, Associate Head for the Humanities, Department of Humanities and Arts,
jcullon@wpi.edu

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to change the prefix and number of HU 2210 Popular Culture and Social Change in Asia to INTL 2210

Motion: On behalf of the International and Global Studies Program and the Humanities and Arts Department, the Committee on Academic Operation recommends and I move that the course number and prefix for HU 2340 Popular Culture and Social Change in Asia be changed to INTL 2210, as described below.

Description of Proposed Change:

Current course description and designation:

HU 2340. POPULAR CULTURE AND SOCIAL CHANGE IN ASIA. Cat. II

Godzilla, kung-fu, anime, sushi, Hello Kitty, yin and yang, Pokémon, manga. All of these have become part of our American lives, but where did they come from and what meaning do they hold as cultural phenomena? In this class we will explore the popular cultures of East Asia to better understand the influences that have shaped the region's contemporary societies. Focus country will be either Japan or China, depending on term offered. Students will study various media of popular culture, such as films, songs, advertisements, video games, manga, anime, to explore the changing society of these countries. We will link the individual cultural phenomenon studied to both internal and external influences, situating popular culture within transnational currents and exchanges when appropriate. No prior knowledge of Asian history is required for this class. This course will be offered in 2019-20, and in alternating years thereafter.

Proposed course description and designation:

INTL 2210. POPULAR CULTURE AND SOCIAL CHANGE IN ASIA. Cat. II

Godzilla, kung-fu, anime, sushi, Hello Kitty, yin and yang, Pokémon, manga. All of these have become part of our American lives, but where did they come from and what meaning do they hold as cultural phenomena? In this class we will explore the popular cultures of East Asia to better understand the influences that have shaped the region's contemporary societies. Focus country will be either Japan or China, depending on term offered. Students will study various media of popular culture, such as films, songs, advertisements, video games, manga, anime, to explore the changing society of these countries. We will link the individual cultural phenomenon studied to both internal and external influences, situating popular culture within transnational currents and exchanges when appropriate. No prior knowledge of Asian history is required for this class. This course will be offered in 2021-22, and in alternating years thereafter.

Students may not receive credit for HU 2340 and INTL 2210.

Rationale:

This change enhances the visibility of this course for students and strengthens the coherence of our curricular offerings in International and Global Studies and area studies. It is the same course with a new number.

This motion replaces HU with INTL as the course prefix. The course number accommodates the numbering system for region-based courses within the INTL curriculum, which are currently as follows:

- INTL 1300 – *Introduction to Latin America*
- INTL 2310 – *Modern Latin America*
- INTL 2410 – *Modern Africa*
- INTL 2420 – *Middle East, North Africa, and Mediterranean*
- INTL 2510 – *Contemporary Europe*

INTL 2520 – *Russia Ready*

Impacts on students: None.

Resource Needs: None.

Implementation Date: Academic Year 2022-23.

Contact: Joseph Cullon, Associate Head for the Humanities, Department of Humanities and Arts,
jcullon@wpi.edu

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to add INTL 2320: Environmental Justice in the Global Caribbean and Latin America

Motion: On behalf of the International and Global Studies Program and the Humanities and Arts Department, the Committee on Academic Operations recommends and I move that INTL 2320: Environmental Justice in the Global Caribbean and Latin America, as described below, be added.

Proposed Course/Catalog Description:

INTL 2320: *Environmental Justice in the Global Caribbean and Latin America*. Cat II

Latin America and the Caribbean are center stage in discussions about the inequalities and injustices of our current global ecological crisis. This course offers a two-fold approach. 1) It examines historical and contemporary processes producing—and contesting—environmental injustices in Latin America and the Caribbean Basin. 2) It analyzes the role of this region in the politics and policy of global environmental inequalities, including the region's relationship with the United States, China, and other major international actors in issues such as climate change and sustainable development. This course is especially appropriate for students interested in environment and sustainability issues and international/global affairs, and for students who expect to complete their HUA, IQP, and/or MQP at WPI Project centers in Latin America or the Caribbean.

Recommended background: None

Anticipated Instructor: William San Martín

Rationale:

This new course is part of a US Department of Education grant-funded interdisciplinary initiative to strengthen WPI's curricular and co-curricular resources devoted to Latin America and the Caribbean. The approach, which examines environmental justice and sustainability issues *in* and *from* this region, responds to fundamental trends in fields such as Latin American and Caribbean History, Latin American & Caribbean Studies, International and Global Environmental History, Global Environmental Politics, and Environmental Studies. It is designed for students with a general interest in this region and its place in global affairs who are completing the Humanities and Arts requirement, with plans to go to WPI project centers in the region, and those returning from the region who want to enrich and extend their engagement with global issues related to Latin America and the Caribbean and/or the environment.

Although HUA offers Spanish-language culture courses on Latin America & the Caribbean, there is an unmet need for English-language courses for students with interests in the region, including students who are from Latin America and the Caribbean, have Latin American and Caribbean heritage, or come from communities in the United States with large Latino/a/x populations. In addition, this course's approach to the environment, social justice, and sustainability facilitates the growth of an interdisciplinary and transregional mindset with students that can be linked to other curricular initiatives across campus situated at the intersection of environment, technology, and regional and global affairs.

Resource Needs: No new resources are required. The enrollment cap will be 25 and the course type is Lecture/Discussion.

Impact on Distribution Requirements and Other Courses: This course will provide additional options for students completing the Humanities and Arts Requirement or Major, the Latin American and Caribbean Studies Minor, the International and Global Studies Minor or Major, the Environmental & Sustainability Studies Minor or Major, and

new programs related to globalsustainability and development.

Implementation Date: First offering - Academic Year 2022-2023

Contact: Joseph Cullon, Associate Head for the Humanities, Department of Humanities and Arts,
jcullon@wpi.edu

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to remove GOV 2318 Comparative Healthcare: Policy, Politics, and Advocacy

Motion: On behalf of the Department of Social Science and Policy Studies, the Committee on Academic Operation recommends and I move that GOV 2318 -Comparative Healthcare: Policy, Politics, and Advocacy be removed.

Current Course description:

GOV 2318 Comparative Healthcare: Policy, Politics, and Advocacy (Cat. II)

The topic of healthcare and health insurance is featured in the media daily and is on the policy table at the local, state, national, and global levels. Many students encounter healthcare issues in their course work or IQPs. In this course, students will gain an introduction to healthcare policy in the United States, which will be compared with health policies across the globe. Utilizing a healthcare disparities and social justice framework, the course explores mental and physical health care policy, history, the present and the future of U.S. health care policy, and how to advocate for policies that address healthcare disparities. The impact of health policy upon individuals, groups, families, and communities is addressed as well. The role of the various levels of government in the provision of healthcare services is covered, as is the role that technology can play in the advancement of healthcare. Students shall not receive credit for both GOV 234X and GOV 2318. Recommended background: Basic background in public policy, such as GOV 1303

Rationale: The main instructor is no longer at WPI.

The course removal will not have any significant impact on students. The course is not required, and students have many other options to meet the Social Science requirement.

This course will not have a replacement.

There are no changes to the Social Science requirement.

Implementation Date: Immediately.

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to convert PH 115X Introductory Physics of Living Systems to a permanent course PH 1150

Motion: On behalf of the Physics Department, the Committee on Academic Operations recommends and I move that PH115X Introductory Physics of Living Systems be converted to permanent course PH 1150, as described below.

Proposed Course Description:

PH 1150 Introductory Physics of Living Systems (Cat.I).

This course introduces a selection of physics topics (Thermodynamics, Optics, Fluid Dynamics, Waves, and Atomic and Nuclear Physics) that are critical to students pursuing degrees in Life Sciences, Pre-Med, and Pre-Health.

Recommended Background: General Physics - Mechanics (PH1110) or Principles of Physics - Mechanics (PH1111), General Physics Electricity and Magnetism (PH1120) or Introductory Physics – Electricity and Magnetism (PH1121), completion or concurrent study of Calculus I (MA 1021) or Calculus II (MA 1022)

Anticipated Instructors and Contacts: Profs. Snehalata Kadam and Izabela Stroe

Intended audience: Physics majors interested in Medical Physics and Applied Physics programs. In addition, students seeking a third course in physics that major in a life science or biomedical related programs, such as Biology and Biotechnology (BBT), Biomedical Engineering (BME) and, students enrolled in the Pre-Health, Pre-Vet and Pre-Med program will benefit with this offering.

Expected enrollment: 24-45

Classroom: The course will be taught in the Physics Department or Innovation Studio. The simulation based laboratories will be taught in the Physics Department.

Implementation Date: AY 2021-22

Rationale:

Nationally, there is an effort to create such introductory courses (Introductory Courses for Life Sciences, <https://www.livingphysicsportal.org/>) that better connect physics content to life science related fields. This course will focus on *fundamental physics of living systems and on physical foundations of the experimental techniques used in life sciences*. In accordance to the mission statement of the Department, this course highlights the different sides of physics pertaining to living systems, generating an interest in Physics degree and/or a minor in Physics. Being interdisciplinary, this course will generate interest in Applied Physics majors like Medical Physics, Health Physics as well as students who opt for a minor in Physics. This course offers an excellent opportunity to the student community about the impact of physics in medicine as well as showcase the educational and career opportunities in physics-based careers. Even though the Physics department has active research in the field of Biophysics, there is no introductory biophysics themed course available. This gap creates a curriculum shortcoming, which this course will overcome.

For non-Physics majors, such as life science or biomedical related fields, this course will provide additional background for the MCAT exams and prepare them for experimental research in life sciences (See Letters of support from the BBT and BME departments and Pre-med advisors appended below the motion). This

course will provide an additional introductory physics option beyond PH1130 (Modern Physics) and PH1140 (Oscillations and Waves) that do not have a focus on life science applications. This course offers an additional option for students seeking to satisfy the 8 credit requirement such as Pre-Med, Pre-Health track students.

The course PH115X was taught on an experimental basis twice (D-2020 and C-2021) to 17 students each time. Based on the student request, the course was also taught during the E terms (E1-2020 and E1-2021). Student interest in the course and topics covered were strong and end-of-course student evaluations were positive:

PH 115X Course Evaluations:

Academic Year	Term	# Students	Q2	Q9
2019-2020	Spring term	17	3.90	4.70
2019-2020	Summer term	4	5.00	5.00
2020-2021	Spring term	17	3.60	4.30
2020-2021	Summer term	10	4.30	4.40

PH 115X Student Comments:

"I appreciated Professors Kadam and Stroe introducing different sides of physics that pertained to living systems."

"I like the material covered, I feel as though it covered much of what I expected would be covered when signing up for the class!"

"I liked being able to relate physics back to life sciences. I thought professor Kadam connected the topics and was able to explain all the concepts clearly and effectively."

"Professor Kadam provided excellent resources and had great answers to any questions I had."

"She was very reassuring if I was concerned and helpful when I was confused. I thought the selection of content was great for the given topics."

Impact on Distribution Requirements and Other Courses: This course will provide an additional course that can be used to fulfil the science requirement for Life Sciences majors.

Resources Needed: No new resources are requested at this time as this course has already been taught for the past two years and hence is part of the teaching load of the department. This course will be taught by Profs. Kadam and Stroe who instructed similar courses at WPI and elsewhere. This course will be accommodated as part of their regular teaching load next year.

Appendix: Detailed Course Description

Mode of Instruction:

The course will engage students in active learning strategies, lectures, in-class assignments, homework assignments, and include a simulation-based laboratory component.

Student Learning Outcomes:

- Students will explore fluid dynamics that applies to motion of biological fluids (e.g. blood flow in arteries, animal flight, fish swimming)
- Students will be able to apply the principles of wave diffraction and interference, reflection and refraction to understand the biological systems at microscopic level.
- Students will be able to apply thermodynamic principles to describe thermodynamic process related to living systems
- Students will be able to apply optics principles to understand biological systems such as the human and animals eyes, how to correct for vision defects, and the fundamentals of optical instruments used in life sciences.
- Students will be able to apply concepts of atomic and nuclear physics to understand radiopharmaceuticals used in treating cancer, the effect of radiation in biological systems, and current medical techniques (CT-SCAN, Tomography, MRI).

Syllabus (built off of Physics of the Life Sciences by Jay Newman and University Physics with Modern Physics by Young and Freedman 15th Edition)

Unit 1:

A. Fluid Mechanics:

a) Gases, Liquids and Density, b) Pressure in a fluid, c) Buoyancy, d) Fluid flow, d) Bernoulli's equation, e) Viscosity (Ch 12).

B. Waves and Resonance:

a) Types of Mechanical Waves, b) Periodic waves, c) Speed of a Transverse Wave, d) Energy in Wave motion (Ch 15).

C. Sound:

a) Sound waves, b) Sound Intensity, c) Resonance and Sound (Ch 16).

Unit 2:

A. Temperature and Heat:

a) Temperature and Thermal Equilibrium, b) Thermometers, c) Mechanisms of Heat Transfer (Ch 17).

B. Thermal Properties of Matter:

a) Equations of State, b) Molecular speeds (Ch 18).

C. The First Law of Thermodynamics:

a) Internal Energy and the First Law of Thermodynamics, b) Adiabatic Processes for an ideal gas (Ch 19).

D. The Second Law of Thermodynamics:

- a) Heat Engines (engine as a biological organism), b) Entropy in Living Organisms and Second Law of Thermodynamics (Ch 20).

Unit 3:

A. Wave Optics:

a) The nature of Light, b) Reflection and Refraction, c) Total Internal Reflection (Ch 33).

B. Optical Lenses and Devices

a) Interference and Coherent Sources, b) Intensity in Interference Patterns, c) The Michelson interferometer (Ch 35).

C. Diffraction:

a) Diffraction, b) The Diffraction Grating, c) X-Ray Diffraction, d) Circular Aperture and Resolving Power (Ch. 36).

D. Geometric Optics:

a) Reflection and Refraction at a plane surface, b) Reflection and Refraction at a spherical surface, c) cameras, d) Lenses, e) The eye, f) Microscopes (Ch 34).

Unit 4:

A. Photons:

a) Light absorbed as Photons: The Photoelectric Effect, b) Light emitted as Photons: X- Ray Production (Ch 38).

B. Nuclear physics and Medical Applications:

a) Properties of Nuclei, b) Nuclear Binding and Structure, c) Nuclear Stability and Radioactivity, d) Activities and Half Lives, e) Biological Effects of Radiation, f) Radioactive isotopes for Medicine (Nuclear Fission) (Ch 43).

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to change the title, description, and schedule for ECE 3500 Introduction to Contemporary Electric Power Systems

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations recommends and I move that the course title, course description, course offering schedule for ECE 3500 Introduction to Contemporary Electric Power Systems be changed, as described below

Description of Proposed Changes:

Current course title, description and course offering schedule:

ECE 3500. Introduction to Contemporary Electric Power Systems [Cat. I, D-Term]

This course introduces basic concepts underlying the current and future methods of generation, transmission, storage, and use of electric energy. Beginning with an historical overview of the electric power system that has served well for more than 100 years, the course provides an introduction to the fundamental engineering principles underlying the design and implementation of traditional as well as modern electric power systems. Energy sources including thermal (combustion, nuclear, geothermal), solar, wind, and chemical (fuel cells) are presented, along with the environmental impacts. Concepts of three-phase systems, transmission and distribution of power, economic and regulatory aspects, as well as communications, protection, and control systems are included. Student project work is included. Recommended background: ECE 2010 or equivalent Suggested background: ECE 2019 or equivalent

Proposed course title, description, and course offering: (Fully re-worded)

ECE 3500. Electric Power and Renewable Energy Systems [Cat. I, A-term]

Concepts integral to the generation, transmission, storage, and use of electrical power are introduced with particular emphasis on economic, environmental, and regulatory influences that have shaped the structure of our power grid for over 100 years. Power generators, including those powered by traditional fossil fuels and renewable sources, are covered, providing a background of technology evolution that leads to distributed energy resources (DERs), energy storage systems, and smart grid solutions. Three-phase lines, loads, and generators are discussed together with the need for power factor calculation and correction. Construction and performance of high voltage transmission lines is introduced. Power flow analysis across a power network from generation to transmission to consumption is provided and modeled, including consideration of basic faults at various points in the network. Methods of energy storage are considered together with basic power grid protection techniques. These technologies converge toward the construction of robust smart grids that employ advanced data analytics and communications for real-time fault identification, load balancing, and correction. Recommended background: ECE 2010

Rationale:

The utility industry is facing many challenges from aging infrastructure and the increasing penetration of multiple power generation points and types, adding complexity to power grid operation. The revised ECE 3500 will offer an opportunity for students to familiarize themselves with modern day challenges of the power industry, opportunities, and solutions. New topics such as power flow analysis in distribution networks have been added. Planned use of the PowerWorld simulator to model power flow and faults across power grids from generation to consumption will provide experience more representative of what students will experience working in the power industry. Also, a goal is to push the course towards data science, machine learning, and smart solutions along the lines of control theory, sensing technologies, energy storage, etc.

Power industry feedback as well as comparative analysis of the power courses from peer institutions was considered. Student learning outcomes for power courses were developed as shown in Fig. 1, and the goal is to achieve those outcomes through a sequence of three power courses including ECE 3500. The revised ECE 3500 will meet pre-requisite requirements (i.e., WPI’s “Recommended Background”) of ECE 3501, which is also being revised. ECE 3500 will be offered in A-term instead of D-term, which will enable students to better schedule our revised power course sequence (see Fig. 2), with subsequent courses scheduled for B and D terms. Changes to ECE 3500 can be seen in Fig. 3 in blue. The new title and course description better reflect the course content.

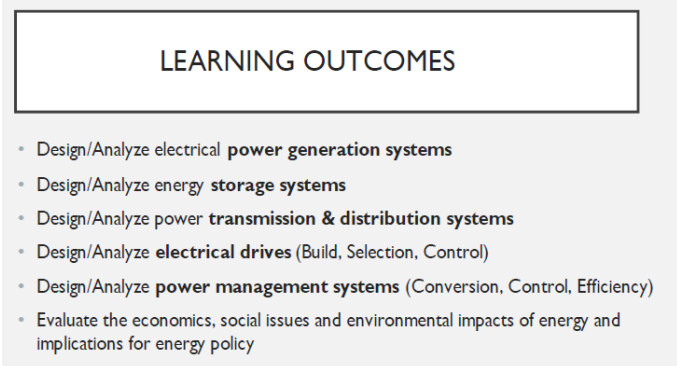


Figure 1

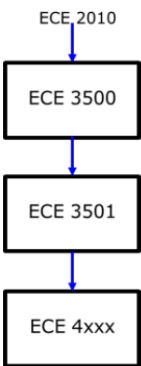


Figure 2



Figure 1

Impacts on students: None

Resource Needs: No changes. Instructor teaching the course is in agreement with these changes.

Implementation Date: 2022-23 Academic year, course will be offered in A-term.

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to change the title, description, and schedule of ECE 3501 Electrical Energy Conversion

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations recommends and I move that the course title, course description, course offering schedule for ECE 3501 Electrical Energy Conversion be changed, as described below.

Description of Proposed Changes:

Current course title, description and course offering schedule:

ECE 3501. Electrical Energy Conversion [Cat. I, A-Term]

This course is designed to provide a cohesive presentation of the principles of electric energy conversion for industrial applications and design. The generation, transmission, and conversion of electric energy, as well as basic instrumentation and equipment associated with electric energy flow and conversion are analyzed. Topics: Review of poly-phase circuits. Transducers and instrumentation for power and energy measurements. Rotating machines. Electromechanical transients and stability. Switchgear equipment. Selected laboratory experiments. Recommended background: ECE 2019.

Proposed course title, description, and course offering:

ECE 3501. Electromechanical Energy Systems [B-term]

The duality of electromechanical systems, which may be used to either generate or consume electrical power, is studied through examination of methods and machines that enable energy conversion to occur. The analysis and design of systems that employ coupled magnetic fields to convert electrical to mechanical energy and vice versa is explored using fundamental electromagnetic concepts, AC/DC systems analysis, and numerical simulation. Generator and motor machine components are modeled using magnetic circuits to demonstrate energy flow. Electric transformers are carefully considered to understand voltage and current conversion with corresponding device power losses. The principles of rotating single and polyphase systems are covered with application examples ranging from micro to industrial scale. AC/DC motors and generators are explored through a review of their physical construction, equivalent circuits, and performance characteristics. Power factor and power factor correction are examined to enable greater system efficiency. Special emphasis is given to synchronous machines, which comprise most of modern power generation, and induction machines, which are used in a myriad of everyday applications. This course includes simulations of motors and generators with some circuit analysis using circuit simulators, project work, and selected power system demonstrations. Recommended background: ECE 3500. Suggested background: ECE 2019, ECE 2112, and ECE 2311.

Rationale:

As the underlying technology of many emerging technologies such as electric vehicles and wind turbines, electromechanical energy is an important topic for ECE students. The revised ECE 3501 will combine electromechanical energy conversion and power systems analysis to offer students an opportunity to learn and investigate electromechanical energy conversion systems, design, and analyze various systems such as polyphase and single phase, optimize the motor/generator configuration, and evaluate its performance via numerical simulation and visualization through use of Matlab/Simulink.

Power industry feedback as well as comparative analysis of the power courses from peer institutions was considered. Student learning outcomes for power courses were developed as shown in Fig. 1, and the goal is to achieve those outcomes through a sequence of three power courses including ECE 3501. The revised ECE 3501 will also meet pre-requisite requirements (i.e., WPI's Recommended Background") of the existing ECE 3503, which is also being revised. ECE 3501 will be offered in B-term instead of A-term, which means students will be able to enroll

after completing ECE 3500 (required background) in A-term, and get into in-depth power courses (see Fig. 2). Great for those who want to pursue a career in the power industry and seek internship opportunities. Changes to ECE 3501 can be seen in Fig. 3 in blue. The new title and course description better reflect the course content.

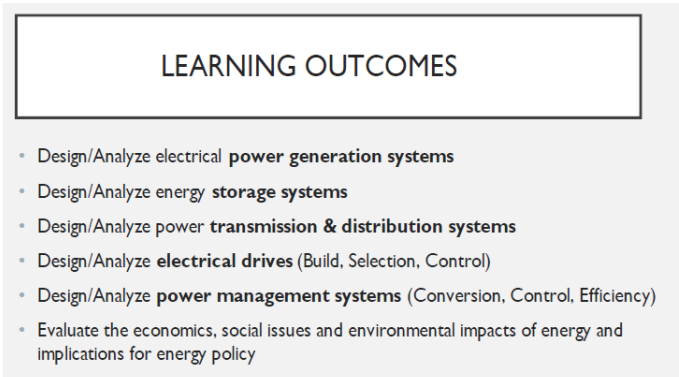


Figure 1

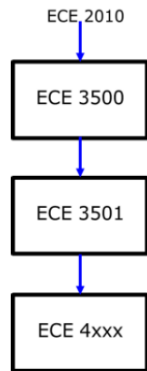


Figure 2

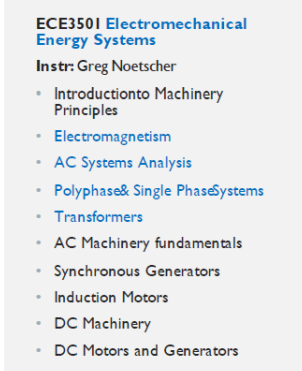


Figure 3

Impacts on students: None

Resource Needs: No changes. Instructor teaching the course is in agreement with these changes.

Implementation Date: 2022-23 Academic year, course will be offered in B-term.

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to change the title, number, description, and schedule of ECE 3503 Power Electronics

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Academic Operations recommends and I move that the course title, number, course description, course offering schedule for ECE 3503 Power Electronics be changed, as described below.

Description of Proposed Changes:

Current course title, description and course offering schedule:

ECE 3503. Power Electronics [Cat. I, B-term]

This course is an introduction to analysis and design of power semiconductor circuits used in electric motor drives, control systems, robotics and power supply. Topics: characteristics of thyristors and power transistors. Steady-state performance and operating characteristics, device rating and protection, commutation, gating circuits, ac voltage controllers, controlled rectifiers, dc/dc converters and dc/ac inverters. Laboratory exercises. Recommended background: ECE 2019, ECE 2201 or equivalent.

Proposed title, description, and course offering:

ECE 4503 Power Electronics and Power Management [Cat. I, D-term]

The availability of electric power in a variety of forms is integral to modern society. Very often, electric power must be converted from one form to another to meet a specific application need – this conversion process is accomplished through the use and efficient management of power electronics. Design of power electronics is introduced first by examining the performance characteristics of basic switching devices, which enable critical management functions that include pulse width modulation (PWM) and output power regulation. Half and full-wave AC source rectification and techniques for improving the resulting DC power characteristics are covered, including polyphase AC sources. AC voltage control with applications for induction motors is studied. DC-DC power conversion is examined, covering a variety of circuit architectures, with applications in feedback control. DC to AC power inversion and resulting power quality considerations are explored. The impacts of design decisions on power electronics systems, from micro- to megawatts, are demonstrated through numerical simulation. This course includes guest lectures, project work including case-studies and selected power system demonstrations. Recommended background: ECE 3204, ECE 3501.

Students who have previously received credit for ECE 3503 may not receive credit for ECE 4503.

Rationale:

There has been massive use of inverter technology for high penetration levels of photovoltaic (PV) generation in distribution networks. Understanding how motors and invertors react with the power grid as power fluctuates is important. For example, what does voltage flicker do to the motor? The revised content will provide this critical knowledge to students. The course will focus upon power supply control and management through efficient use of power electronics including inverters. The goal is to push the course more towards data analytics and simulations to observe changes in operation due to various stimuli (i.e., pulse width modulation).

Power industry feedback as well as comparative analysis of the power courses from peer institutions was considered. Student learning outcomes as shown in Fig. 1 were developed, and the goal is to achieve those outcomes through a sequence of three power courses including ECE 4503. ECE 4503 will be offered in D-term instead of B-term, which means students can enroll in ECE 4503 following ECE 3500 and ECE 3501 in A- and B-terms, respectively. Great for those who want to pursue a career in the power industry and seek internship opportunities in the following summer. ECE 4503 will be the last in-depth power course (see Fig. 2) in our revised power sequence. Changes to ECE 4503 can be seen in Fig. 3 in blue. The new title and course description better reflect the course

content, and the new content makes it a deserving 4000-level course which will provide students a smooth transition into a graduate program in Power Engineering at WPI (or other schools).

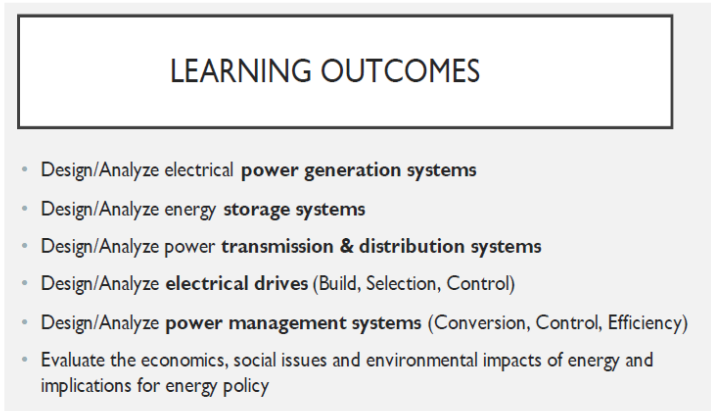


Figure 1

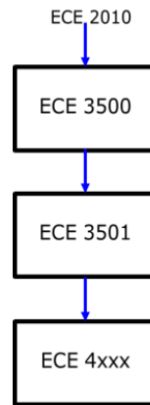


Figure 2

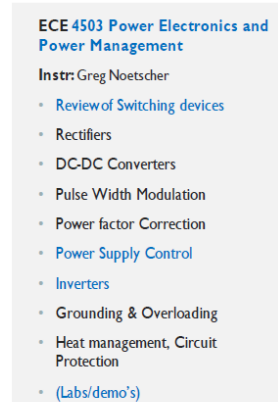


Figure 1

Impacts on students: None

Resource Needs: No changes. Instructor teaching the course is in agreement with these changes.

Implementation Date: 2022-23 Academic year, course will be offered in D-term.

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to add ME 4503 Computational Biomechanics as a cross-listed course with BME 4503

Motion: On behalf of the Mechanical and Materials Engineering Department, the Committee on Academic Operations recommends and I move that ME 4503 Computational Biomechanics be added as a cross-listed course with BME 4503, as described below.

Proposed Course Description:

ME 4503 Computational Biomechanics (Cat. II)

This course will focus on using computational modeling approaches, particularly, finite element models, to simulate, validate, and analyze the biomechanics involved in soft and hard tissue deformation and stress/strain analysis in quasi-static or impact conditions. First, students will be introduced to the process of setting specific analytical goals and establishing the need for a specific quantitative biomechanical model. Then, basic underlying principles of forward and inverse static/dynamics simulations are covered. Finally, multi-scale and multi-step models will be introduced. During the process, material models and property assignment will also be covered. Model building, testing, optimization and validation with experimental data will be discussed. An introduction to tools and techniques used in computational biomechanics will be provided.

Recommended background: Basic knowledge of solid mechanics (ES 2501, ES 2502, ES 2503, ME 3501 or equivalent), differential and integral calculus (i.e., MA 2051 or equivalent), MATLAB programming (BME 2211 Data Analysis).

Anticipated instructor: Prof. Songbai Ji

Alternate Instructors: Prof. Karen Troy, or Prof. Adam Lammert. While we expect this will be taught by BME faculty, Prof. Yihao Zhang of ME is a possible instructor.

Resource Needs: None

Impact on Distribution Requirements:

This will be added to the Biomechanical concentration in mechanical engineering.

Rationale:

This course fits in with several ME/BME cross-listed courses which have remained popular. The computational aspect is much needed.

Implementation Date: AY 2022-23

Date: December 2, 2021
To: WPI Faculty
From: Committee on Academic Operations (Prof. Titova, Chair)
Re: Motion to remove IMGD 2001 Philosophy and Ethics of Computer Games

Motion: On behalf of the Interactive Media and Game Development (IMGD) program, the Committee on Academic Operation recommends and I move that IMGD 2001 Philosophy and Ethics of Computer Games be removed.

Description of Proposed Changes:

Description of course to be removed:

IMGD 2001. Philosophy and Ethics of Computer Games (Cat II, C-terms)

This course introduces students to some of the political and ethical dimensions of the new entertainment modalities. Students will explore such issues as representation and power (e.g., gaming and disability, and race stereotyping in games), the phenomenology of virtual reality, capitalism and the commodification of leisure, gender and sexual violence, and cyberspace and democracy.

Students will also develop critical tools for evaluating the ethical and social content of their own and others' games. In addition to writing several analytical papers on the critical theory of technology, students will be encouraged to work on game designs exploring philosophical or social themes.

Recommended background: IMGD 1000.

Impact on distribution requirements and other courses:

IMGD: Dropping IMGD 2001 will reduce the number of courses which satisfy the IMGD Social and Philosophical Issues requirement to a single offering (IMGD 2000: Social Issues in IMGD). As noted above, this reduction is expected to be temporary. IMGD's annual offerings of IMGD 2000 (Cat. I) will be sufficient to meet student demand for the interim period.

IMGD 2001 currently appears as an option (together with IMGD 2000) in the lists of recommended background courses for IMGD 4200: History and Future of Immersive and Interactive Media and IMGD 4600: Serious Games. Removing the IMGD 2001 option from these lists will not significantly impact the Department's ability to prepare students for these courses.

CS: The CS Department currently specifies a list of six courses (CS 3043, GOV/ID 2314, GOV/ID 2315, IMGD 2000, IMGD 2001 or RBE 3100) which can be used to satisfy the Social Implications of Computing distribution requirement of their BS degree. Removing IMGD 2001 from the list will not significantly impact the Department's ability to meet student demand.

HU&A: The Professional Writing major currently specifies a list of thirteen courses (AR/ID 3150, CS 3041, CS 3043, EN 2252, HI 2334, HI 2402, HI 3331, HI 3333, HI 3334, IMGD 2000, IMGD 2001, GOV 2302, PSY 2406) which can be used to satisfy their 1-unit Electives distribution requirement.

The Media Arts minor currently specifies a list of six courses (IMGD 1000, IMGD 2001, GN 3516, HU 2251, SP 3530, WR 2310) which can be used to satisfy their 1/3 unit Critical Studies in Art distribution requirement.

The International and Global Studies minor also includes IMGD 2001 in their extensive list of International and Global Humanities and Arts Courses.

Removing IMGD 2001 from these lists will not significantly impact HU&A's ability to meet student demand.

Other Required Changes to Catalog:

(Page numbers refer to the AY20-21 Undergraduate Catalog, the most recent published edition. Deleted text denoted by ~~strikethrough~~)

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Program Distribution Requirements for the Computer Science Major

b. Must include at least 1/3 unit from each of the following areas: Systems (CS 3013, CS 4513, CS 4515, CS 4516), Theory and Languages (CS 3133, CS 4120, CS 4123, CS 4533, CS 4536), Design (CS 3041, CS 3431, CS 3733, CS 4233), and Social Implications of Computing (CS 3043, GOV/ID 2314, GOV/ID 2315, IMGD 2000, ~~IMGD 2001~~, RBE 3100). (If GOV/ID 2314, GOV/ID 2315, IMGD 2000, ~~IMGD 2001~~ or RBE 3100 is used to satisfy this requirement, it does not count as part of the 6 units of CS.)

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Program Distribution Requirements for the Professional Writing Major

b. Electives (1 unit)

The 1 unit of electives must be coherently defined and approved by the student's program review committee. Students may draw on:

Courses in Writing and Rhetoric not used to fulfill the above 2 units requirement; Courses in science, technology, and culture studies (such as AR/ID 3150, CS 3041, CS 3043, EN 2252, HI 2334, HI 2402, HI 3331, HI 3333, HI 3334, IMGD 2000, ~~IMGD 2001~~, GOV 2302, PSY 2406;

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List 2. Critical Studies in Art

IMGD 1000 Critical Studies of Interactive Media and Games ~~IMGD 2001 Philosophy & Ethics of Computer Games~~
GN 3516 German Film
HU 2251 Introduction to Film Studies SP 3530 Spanish Film/Media

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INTERACTIVE MEDIA & GAME DEVELOPMENT (BACHELOR OF ARTS)

**Distribution Requirements for the IMGD Major,
IMGD Social & Philosophical Issues 1/3**

Choose 1/3 unit from:

- Social Issues in Interactive Media & Games (IMGD 2000)
- ~~Philosophy & Ethics of Computer Games (IMGD 2001)~~

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INTERACTIVE MEDIA & GAME DEVELOPMENT TECHNOLOGY (BACHELOR OF SCIENCE)

**Distribution Requirements for the IMGD Technology Major
IMGD Social & Philosophical Issues 1/3**

Choose 1/3 unit from:

- Social Issues in Interactive Media & Games (IMGD 2000)
- ~~Philosophy & Ethics of Computer Games (IMGD 2001)~~

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International and Global Humanities and Arts Courses

IMGD 2000 Social Issues in Interactive Media and Games

~~IMGD 2001 Philosophy and Ethics of Computer Games~~

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Course Descriptions

INTERACTIVE MEDIA & GAME DEVELOPMENT

~~**IMGD 2001. PHILOSOPHY AND ETHICS OF COMPUTER GAMES.**~~

~~*Cat. II*~~

~~This course introduces students to some of the political and ethical dimensions of the new entertainment modalities. Students will explore such issues as representation and power (e.g., gaming and disability, and race stereotyping in games), the phenomenology of virtual reality, capitalism and the commodification of leisure, gender and sexual violence, and cyberspace and democracy.~~

~~Students will also develop critical tools for evaluating the ethical and social content of their own and others' games. In addition to writing several analytical papers on the critical theory of technology, students will be encouraged to work on game designs exploring philosophical or social themes.~~

~~Recommended background: IMGD 1000.~~

~~This course will be offered in 2019-20, and in alternating years thereafter.~~

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IMGD 4200. HISTORY AND FUTURE OF IMMERSIVE AND INTERACTIVE MEDIA.

Cat. II

This course will familiarize students with the history of the development, deployment, commercialization, and evolution of immersive and active media. The lesson plan will cover a broad range of enabling technologies, such as geometric perspective drawing, pre-20th-century panoramic displays, photography and the stereoscope, sound recording and reproduction, motion pictures, radio and television, the planetarium, immersive and 3-dimensional cinema, and special attraction venues, with a particular focus on digital games. Current trends and future directions will also be considered. Students will attend seminars and lectures, read and discuss texts on media history and aesthetics, and write an original research paper. Midterm and final exams test students' knowledge and understanding of important events and developments. A student may not receive credit for both IMGD 4200 and IMGD 5200.

: IMGD 1000, and either IMGD 2000 or IMGD2001. -

IMGD 4600. SERIOUS GAMES.

Cat. II

This course explores the application of the technologies and design principles of interactive media and game development beyond traditional entertainment. The purpose of such applications is typically to change people's behaviors, knowledge and/or attitudes in diverse areas including health care, training, education, simulation, politics, marketing and art. Students read about, experiment with, compare and discuss examples, as well as the underlying philosophies and issues specific to this genre, such as domain analysis and rigorous evaluation. Students in groups also research a new application and produce a detailed design document and mock-up. Advanced programming skill is not required, but a background in game design is strongly recommended.

Recommended background: IMGD 1000, and either IMGD 2000 or IMGD2001.

Students may not receive credit for both IMGD 4600 and IMGD 404X. This course will be offered in 2019-20, and in alternating years thereafter.

Rationale:

The HU&A faculty member (John Sanbonmatsu) who taught IMG2001 every other year for several years has been reassigned, and IMG2001 no longer has the resources to offer the course. In addition, IMG2001 can meet the educational objectives of the course by drawing from alternate offerings.

A course to replace IMG2001: In AY20-21, Yunus Telli developed and taught an experimental HU&A course on design ethics (WR 200X: Rhetoric and Ethics of Design) which satisfies the educational outcomes of the IMG2001 Social and Philosophical Issues requirement. The course is being offered again in D22. When it becomes permanent, IMG2001 will submit a motion to offer it as an option for the IMG2001 Social and Philosophical Issues requirement.

Resources Needed: No changes to faculty or classroom resource requirements are anticipated. The anticipated HU&A replacement course (WR 200X) is already assigned to Professor Telli's regular course load.

Implementation Date: Implementation date for this action is the 2022-23 Academic year.

Date: December 2, 2021
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Korkin, Chair)
Re: Motion to change course description for ECE 503 Digital Signal Processing

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Graduate Studies and Research recommends and I move that the course description for ECE 503 Digital Signal Processing be changed, as described below.

Description of Proposed Change:

Current course description:

ECE 503 *Digital Signal Processing* (3 credits)

Discrete-time signals and systems, frequency analysis, sampling of continuous time signals, the z-transform, implementation of discrete time systems, the discrete Fourier transform, fast Fourier transform algorithms, filter design techniques. (Prerequisites: Courses in complex variables, basic signals and systems.)

Proposed course description:

ECE 503 *Digital Signal Processing* (3 credits)

This course develops an in-depth understanding of discrete-time signals and systems including sampling and quantization of continuous time signals, implementation and design of discrete time systems and filters, as well as time-domain, frequency-domain, and transform-domain analysis. Other advanced topics to be introduced may include: sample-rate conversion, polyphase filters, power spectrum estimation, and discrete wavelet transforms. (Prerequisites: An undergraduate course in digital signal processing (e.g., ECE 2312). Alternatively, students with a strong undergraduate background in complex variables and programming, combined with prior experience in continuous-time signals and systems can perform well in the course, with extra work.)

Rationale:

The impetus for changes is due to the vagueness in the existing description of course prerequisites. This listing appears to be at least three decades old, predating the existence of an undergraduate course on this topic. Thus, our changes clarify that an undergraduate course on this topic is now an expected prerequisite. The graduate course reviews the undergraduate material (but in more depth) and continues onto more advanced material. With this revision, we are also taking the opportunity to describe the course material in more detail, and updating certain course topics to reflect modern terminology. The revised description is now reflective of the actual course offerings from the past several years.

Impact on Degree Requirements: No changes.

Resources and Anticipated Instructors: No changes. These catalog updates reflect the current manner in which the course is being offered. The faculty who have recently taught the course are in agreement with these changes.

Implementation Date: Next available graduate catalog printing.

Date: December 2, 2021
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Korkin, Chair)
Re: Motion to change the course title and description for ECE 538 Wireless Information Networks

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Graduate Studies and Research recommends and I move that the course title and course description for ECE 538 Wireless Information Networks be changed, as described below.

Description of Proposed Change:

Current course description:

ECE 538 Wireless Information Networks (3 credits)

Overview of wireless information networks and personal communications systems: digital cellular, wireless PBX, cordless phone, wireless LAN, and mobile data, multimedia wireless and directions of the future. Radio propagation modeling for urban and indoor radio channels, coverage interface and cell size. Modulation techniques for efficient use of bandwidth resources. Methods to increase the data rate: antenna diversity and sectorization, adaptive equalization, multirate transmission and multi-amplitude phase modulation. Spread spectrum for digital cellular, personal communications and wireless LAN applications. TDMA, CDMA, ALOHA, and CSMA, DECT, GSM, USDC, JDC, IEEE 802.11, WINForum, and HIPERLAN. (Prerequisite: Background in networks. Familiarity with probability, statistics and signal processing).

Proposed course description:

ECE 538 Wireless Technologies and Applications (3 credits)

A preview of evolution of wireless information networking standards and technologies for personal, local and six generations of cellular networks, and the distinct role of Wi-Fi in this evolution. Radio Frequency (RF) cloud from wireless devices and embedded big data in them. Models for the behavior of features of RF signals from wireless devices: the Received Signal Strength (RSS), Time-of-Arrival (TOA), Direction of Arrival (DOA), Channel Impulse Response (CIR), and Channel State Information (CSI). Application of models for features of RF signal for design and performance evaluation of mainstream wireless communication technologies: Spread Spectrum, Orthogonal Frequency Division Multiplexing (OFDM), Multiple-Input-Multiple-Output (MIMO) antenna systems, Ultra-Wideband (UWB) and millimeter wave (mmWave) technologies. RSS and TOA features of RF fingerprints of wireless devices for opportunistic positioning and tracking using Wi-Fi and cellular signals. Application of Artificial Intelligence (AI) algorithms and RSS, CIR, and CSI fingerprints of wireless devices to motion and gesture detection, as well as authentication and security.

The course is complemented with practical MATLAB oriented assignments, and multi-media supplements. Students will prepare a term paper throughout the course on a topic negotiated with the instructor.

Rationale:

This was the first wireless course in WPI, and possibly anywhere else, which was introduced in mid-1990's based on pioneering research at WPI on wireless networks, when WPI also published the first textbook on this field "Wireless Information Networks", K. Pahlavan and A. Levesque, Wiley Interscience, 1995. Later on, WPI introduced ECE506: Introduction to LANs and WANs and ECE5307 Wireless Access and Location based on other pioneering books published by WPI in 2002, 2009, 2013 and 2019 describing technologies behind the rapid evolution of this field. In time, some of the material of ECE538 integrated in these other courses. At the same time new applications of wireless technologies became popular and the focus of research at WPI. The ECE538 was offered every other year until 2015 with some gradual revisions to include more applications, in 2017 since the sole instructor was on sabbatical leave course was not offered, and then in 2020 it was taught with a comprehensive revision that is better described with the new title and description that is provided here.

Impact on Degree Requirements: These changes will not have any impacts on degree requirements.

Resources and Anticipated Instructors: We have staff to teach the revised version in class and online and it is scheduled for Spring 2022.

Implementation Date: First time these revisions with new title and revised syllabus was taught in Spring 2020 with 9 in class and 9 online students. The first offering with official change in title and description is scheduled for Spring 2022.

Date: December 2, 2021
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Korkin, Chair)
Re: Motion to add RBE 522 Continuum Robotics

Motion: On behalf of the Robotics Engineering Department, the Committee on Graduate Studies and Research recommends and I move that that RBE 522 Continuum Robotics, as described below, be added.

Proposed Course Description:

RBE 522: Continuum Robotics (Term-based course, 2 Credits)

Continuum robotics focuses on the study of “continuously flexible” robotic arms. This branch of robotics takes inspiration from flexible animal appendages (e.g., elephant trunks and octopus tentacles) to create manipulators capable of complex bending motions. Real-world applications of continuum robots include minimally invasive surgery, industrial inspection, and more generally any scenario that requires manipulation within highly unstructured, confined environments, where traditional rigid-link robotic arms are not suitable for use. This course introduces students to fundamental topics in continuum robot design, modeling, and control. The course culminates in the development of a continuum robot simulator, where students apply the concepts learned in the classroom. Continuum robot platforms will also be available for laboratory/experimental work.

Prerequisites: RBE 501 and RBE 502, or equivalent courses.

Anticipated Instructor: Prof. Loris Fichera

Intended audience: Graduate students in Robotics Engineering, Mechanical Engineering, Aerospace Engineering, and Applied Mathematics

Expected enrollment: 10-20 students

Rationale:

Continuum robotics is an emerging branch of robotics that focuses on the creation of joint-less “continuously flexible” arms capable of complex bending motions. To date, continuum robots have proved to be especially useful in minimally invasive surgery, where their continuous structure enables physicians to navigate through confined cavities within the human body and reach otherwise inaccessible anatomy. Once purely the subject of scientific inquiry, surgical continuum robots have now reached the market, as illustrated by the recent launch of systems like the [Monarch](#) (Auris Health, Redwood City, CA), [ION](#) (Intuitive Surgical, Sunnyvale, CA), and [Virtuoso](#) (Virtuoso Surgical, Nashville, TN). Outside of the medical space, continuum robots have recently been launched on the market for applications in industrial inspection ([OC System](#), GE Aviation, Bristol, UK) and manipulation ([Bionic Handling Assistant](#), Festo SE, Esslingen, Germany).

The increasing popularity of continuum robots is creating a demand for engineers capable of designing, building, modeling, and controlling these complex systems. The introduction of this course will provide students of the RBE MS program with a new depth option for their degree. This course will also provide foundational knowledge to doctoral students interested in continuum robotics research.

The proposed course was previously offered by Prof. Fichera from 2018 to 2020 as a **special topics RBE course entitled “Advanced Surgical Robotics.”** Course enrollments and evaluations are listed below:

- Fall semester 2018, enrollment: 3
Average student course evaluation: 5/5; Average instructor evaluation: 5/5
- B term 2019, enrollment: 10
Average student course evaluation: 4.7/5; Average instructor evaluation: 4.8/5

- B term 2020, enrollment: 14
Average student course evaluation: 4.8/5; Average instructor evaluation: 4.9/5

The course is now being re-titled “Continuum Robotics” and its scope is being expanded to attract a broader audience of students. A tentative outline of topics to be covered is provided in the additional information below.

This course complements and extends the existing academic offering of the RBE department. Among existing courses, the most closely related is RBE 530 (Soft Robotics), whose main focus is on the study of techniques and materials to create flexible/compliant robotic systems (e.g., series elastic actuators, pneumatic actuators, elastomers, etc.). Continuum robots are a sub-set of soft robots whose structure deforms as a deformable continuum, and for which specialized construction, modeling, and sensing techniques have been developed over the past two decades – these techniques are the subject of the proposed new course. *Continuum Robotics* has been designed assuming that students have no prior knowledge of soft robotics, therefore RBE 530 will not be a prerequisite.

Additional course information:

Tentative Course Schedule: The course is articulated in a total of 28 contact hours, as detailed in the next page.

Week	Date	Topic
1	-	Course Introduction Taxonomy of Continuum Robots Topics in Continuum Robotics research
2	-	Kinematics of Continuum Robots <ul style="list-style-type: none"> • Models based on constant curvature (Webster, 2010) • Robot-dependent vs. robot-independent kinematics (Webster, 2010) • Mechanics-based models (misc. papers)
3	-	Differential Kinematics of Continuum Robots <ul style="list-style-type: none"> • Robot-dependent vs. robot-independent Jacobian (Webster, 2010) • Derivation of the robot-independent Jacobian (Webster, 2010) • Case study: robot-dependent Jacobian for concentric tube robots (Webster, 2010)
4	-	Dynamics of Continuum Robots <ul style="list-style-type: none"> • Cosserat Rod Modeling (Rucker, 2019) • Elastic Instability (Gilbert, 2017)
5	-	Sensing for Continuum Robots <ul style="list-style-type: none"> • Review of sensing modalities for continuum robots • Sensor selection and placement (Mahoney, 2018)
6	-	Design Optimization of Continuum Robots <ul style="list-style-type: none"> • Kinematic design optimization (Burgner-Kahrs, 2015) • Case study: tube selection for concentric tube robots (Burgner-Kahrs, 2015)
7	-	Guest Lecture: Latest Research Results

Impact on Degree Requirements: This course is not a required course for any degree.

Resources and Anticipated Instructors: This course is included in the regular teaching load of Prof. Loris Fichera. A classroom with a capacity of 20 seats, a projector, and screen capture is required.

Implementation Date: Implementation date for this action is the 2022-2023 academic year.