

**WORCESTER POLYTECHNIC INSTITUTE**  
**February 14, 2017**

**To:** The WPI Faculty

**From:** Mark Richman  
Secretary of the Faculty

The sixth Faculty meeting of the 2016-2017 academic year will be held on **TUESDAY, February 14, 2017** at 3:15 pm in **Olin Hall 107**, with refreshments at 3:00 pm.

1. Call to Order M. Richman
  - Approval of the Agenda
  - Approval of the Consent Agenda and the Minutes from 1-19-17
  
2. Opening Announcements M. Richman
  
3. President's Remarks L. Leshin
  
4. Committee Business
  - Committee on Academic Operations (CAO) G. Iannacchione
    - February 2017 Undergraduate Student Graduation List
  
  - Committee on Graduate Studies and Research (CGSR) K. Troy
    - February 2017 Graduate Student Graduation List
  
  - Committee on Appointments and Promotions (COAP) P. Hansen
    - Motion to Modify the Criteria for Promotion to Full Professor
  
5. Old Business
  
6. New Business
  
7. Closing Announcements
  
8. Adjournment

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**WORCESTER POLYTECHNIC INSTITUTE**  
**Faculty Meeting Minutes**  
**January 19, 2017**

**Summary:**

1. Call to Order
2. Opening Announcements
3. President's Remarks
4. Provost's Remarks
5. Committee Report: COG
6. Adjournment

**Detail:**

1. Call to Order

The fifth Faculty meeting of the 2016-2017 academic year was called to order at 3:25pm in OH 107 by **Prof. Richman** (ME). The meeting agenda and the minutes from December 16, 2016 were approved as distributed.

2. Opening Announcements

**Prof. Richman** (ME) reported that the Provost, the Dean of Business, Senior Vice President Tichenor, and the Vice President of Academic and Corporate Engagement are each to be evaluated by the Faculty in this year's cycle of Faculty evaluations of administrators. He explained that, as always, the survey questions had been written to align with the administrative job responsibilities. He encouraged all faculty members to participate in a constructive way.

**Prof. Vernescu** (VPR, MA) explained that WPI is formally part of eight out of the 14 National Networking Manufacturing Institutes (NNMIs). These Institutes come with \$70M of funding with a matching requirement and have both a research translational component and a workforce training component. In the upcoming weeks, there will be informational meetings to involve all interested WPI faculty members. VPR Vernescu also described a manufacturing engineering education grant program recently approved by the Congress in which 20 to 25 universities will each be funded at about \$20M to redesign their manufacturing programs. On February 23<sup>rd</sup> there will be an information session about how we can successfully compete for these funds.

**Antje Harnisch** (Director, OSP) introduced Orla Baxter (Assoc. Director, Pre-Award Services, OSP).

**Prof. Weekes** (MA), co-Chair of the Dean of Arts & Sciences search committee, announced that the search committee is working with the Isaacson, Miller search firm. She urged all those in attendance to forward by email the names of candidates who would be well suited for the position of Dean of Arts and Sciences at WPI.

**Prof. Richman** (ME) gave a lighthearted presentation about one idea, originated at Huston-Tillotson University, for improved campus sustainability. That initiative has now grown into what is called the Dumpster Project (<http://dumpsterproject.org/>).

3. President's Remarks

**President Leshin** introduced David Bunis as WPI's new Senior VP & General Counsel. Pres. Leshin then gave a brief update on the Strategic Plan progress, which includes the following: a ten percent increase in the number of students applying for off-campus IQPs next year; WPI membership in eight NNMIs; three NSF CAREER awards for young WPI faculty members; nine universities working with WPI's Center for Project-based Learning; a Leadership Institute for our Ph.D. students; and a retreat hosted by the Deans in December to establish cross-cutting research collaborations.

**President Leshin** gave credit to Provost Bursten for studying the issue of space allocation on campus and for raising it with the Trustees to demonstrate that it is a serious campus constraint. Pres. Leshin announced that this year's Trustees' recognition of Faculty Achievement (on February 23 at 5:30pm) will be devoted to celebrating WPI's #1 ranking in the Wall Street Journal for teaching/research balance.

**President Leshin** described an ongoing project of reimagining the Higgins House dining room as a café and gathering space, and urged people to share their ideas for the space with Prof. Dominko and Prof. Richman, who

have been at work on the project. Lastly, the President reported that in a New York Times ranking of universities that measures the fraction of students from the top one percent in family income relative to the fraction students from the bottom 60 percent in family income at each institution, WPI happily ranked 270<sup>th</sup>!

#### 4. Provost's Remarks

**Provost Bursten** summarized the report he gave at a recent meeting of the Association of Independent Technological Universities (AITU). He reported on our strong enrollment, WPI's recognition as last year's Gordon Prize recipient, WPI's new relationship with Tsinghua University, the launch of our Center for Project Based Learning, the #1 Wall Street Journal ranking in teaching/research balance, three NSF CAREER award recipients from WPI, successful recruitment of senior faculty members, a new Dean of Engineering, a new University Librarian, a new VP for Talent Development and Chief Diversity Officer, a new General Counsel, and involvement of WPI in eight NNMI's.

**Provost Bursten** suggested that making the transition to online course evaluations would improve WPI's sustainability efforts. In addition, he reported on a letter WPI received from the Executive Director of ABET commending Prof. Liang (ME) on her work with colleagues in China on ABET criteria and accreditation. Finally, Provost Bursten pointed out that we need to remain committed to the ideals embodied by tenure and academic freedom, and that we should seize the opportunities that may present themselves as faculty members look to move on from universities at which these ideals are increasingly threatened.

#### 5. Committee Business

##### COG

**Prof. Dominko** (BBT), for the Committee on Governance, moved to revise the Faculty Handbook description of the Committee on Appointments and Promotions (COAP), as described in the distributed materials. (See **Addendum #1**, attached to these minutes.) Prof. Dominko explained the changes made to the motion based on feedback received at and since the December 2016 Faculty meeting. First, the candidate's Nominator and the Advocate are now specified as non-voting members of the Joint Promotion Committee. Secondly, the review of initial appointments of associate professors hired with tenure are now added back to COAP's responsibilities. Prof. Dominko also explained that the motion did not change the possibility of a path to promotion without Departmental involvement, and it did not expand the eligibility on COAP beyond full (tenured) professors. The remainder of the motion is as it was described at the December meeting. If the motion were to pass, it would take effect on July 1, 2017, which means that elections for three new COAP members would have to be conducted this spring.

**Prof. Hansen** (HUA), as Chair of COAP, stated that COAP opposed the motion in its totality. However COAP felt an obligation to move forward with time sensitive parts of the motion. Prof. Hansen moved to divide the motion and consider only the part pertaining to "membership and election procedure."

**Prof. Richman** ruled that the motion was not divisible in the way that Prof. Hansen suggested because the part of the motion identifying seven COAP members, which would be included, is inherently related to a separate section referring to six members of COAP, which would be eliminated.

**Prof. Hansen** moved that the entire motion be returned to COG and COAP for revision before it is considered by the Faculty at some future date. The motion was **seconded**.

**Prof. Dominko** explained that COG has had a variety of input from members of the Faculty on this issue and believes that what is proposed here today represents the strongest consensus of the Faculty. Prof. Dominko was skeptical that additional private deliberations would advance the issue further, and that the small differences that remain should be decided by the Faculty in this forum.

**Prof. Boudreau** (HUA) opposed the motion for further deliberation by COG and COAP, but wanted to understand COAP's substantive – rather than procedural - objections to COG's motion.

**Prof. Hansen** expressed the view that COG preaches collaboration but does not practice it. There are substantive details in the motion, particularly related to the functioning of the Joint Promotion committee, that need to be articulated through the procedures that COAP will be using in consideration of a case. Prof. Hansen thought that COAP and COG should agree to agree rather than agree to disagree. He stated that there has been no attempt by COG to talk with COAP since October.

**Prof. Dominko** expressed her view that what the Faculty strives for is a respectful sharing of conflicting views. She described the role of the Chair of COG as a liaison between COG and other Faculty committee Chairs. Prof. Dominko explained that COG has undertaken in good faith the task of bringing forward a proposal that reflects what the Faculty thinks is best. She hoped that the remaining discussion would focus on the substance of the COG motion.

**Prof. Burnham** (PH) asked for clarification about the substantive differences between COG and COAP on the proposal.

**Prof. Martin** (MA), as a current member of COAP, explained that the current Handbook states that COAP is responsible for the promotion criteria, so it is COAP's responsibility to bring such matters to the Faculty for a vote. In COAP's view involving other committees would not make that process more efficient. Secondly, he thought that a point worth debating in the COG proposal was whether it made sense to include the Advocate as a member of the Joint Promotion Committee, yet to require recusal of any member of Joint Promotion Committee with a conflict of interest. Also, COAP's feeling is that the Faculty should decide about the proper promotion criteria before deciding about the process that would be used to evaluate each candidate.

**Prof. Sullivan** (ME), as current member of COAP, was in favor of sending the COG motion back for further consideration by both COG and COAP. He thought that the criteria for promotion should be approved before making modifications to the promotion process, and he believed there are problems with having the Nominator and Advocate serve as members of the Joint Promotion Committee throughout the deliberations. He also thought that the promotions deliberations should more closely resemble the CTAF structure, especially with respect to Departmental input.

**Prof. El-Korchi** (CEE/FPE) spoke against returning the motion to the committees. In his view, COG is respecting COAP's responsibility for the promotion criteria and is properly bringing the administrative matters to the Faculty.

**Prof. Gatsonis** (ME) spoke against the idea of sending the COG motion back for further consideration. In his view, the COG motion is a sensible set of measures that more closely aligns COAP operations with those of CTAF. He suggested that COAP can modify the criteria, and can bring amendments for involvement by Departments and Department Heads, if they wish. In the past, changes to CTAF procedures were also steered by COG because COG is responsible for the operation and administration of faculty governance committees. He suggested that the COG motion be moved forward, with the expectation that COAP will then bring its motion concerning the promotion criteria.

The **motion** to return the proposal to COG and COAP **did not pass**.

A **motion** to extend the meeting for 10 minutes was **seconded** and **passed**.

**Prof. Jiusto** (IGSD) thought that the membership of COAP should be extended to include associate professors as well as full professors. **Prof. Dominko** explained that such a change is not being proposed at this time by COG, and that we should focus the current discussion on the changes that have been proposed.

**Prof. Martin** (MA) questioned what was meant by a "direct conflict of interest" in reference to members of the Joint Promotion Committee. **Prof. Dominko** explained that such language parallels that used in the CTAF procedures. As a member of CTAF, **Prof. Rulfs** (BBT) explained that conflicts have nothing to do with departmental overlaps or friendships. Rather, conflicts occur, for example, due to financial or amorous relationships, and they are clear identifiable conflicts. So it is correct to include in the COAP procedures the requirement that neither the Advocate nor the Nominator should have these conflicts with the candidate. **Prof. Martin** (MA) indicated that COAP currently determines that there is a conflict of interest when a member is influenced to make a decision on the case based on something other than the evidence presented. **Prof. Dominko** pointed out that the Advocate and the Nominator have always participated in discussions of promotion cases, and that their advocacy for the candidate cannot be categorized as a conflict of interest. **Prof. Panchapakesan** (ME) cited an example of a business relationship that would, by contrast, constitute a conflict of interest.

**Prof. Clark** (HUA), as Chair of CTAF, explained that at a small institution such as WPI in which there are close relationships between many people, we have to trust ourselves to make professional decisions and that are fair to the institution as well as to the candidate.

**Prof. Gatsonis** (ME), as former Chair of CTAF, explained that there is a systematic process by which conflicts of interest are identified before each CTAF deliberation. It involves distributing a clear list of possible conflicts for all members to consider, and he thought that COAP should be brought into compliance with this procedure.

**Prof. Roberts** (CHE) asked about the purpose of having the Advocate and Nominator serve as non-voting members of the committee. **Prof. Dominko** explained that the Joint Promotion Committee was proposed to extend the involvement of the Advocate and the Nominator to help present the strongest possible promotion case. **Prof. Wobbe** (UG Stud), as a previous member of CTAF, pointed out that having the Nominator and Advocate present throughout the deliberations will serve to clear up innocent confusions that often occur when people from different disciplinary backgrounds use language that can have different meanings in different disciplines.

A **motion** to extend the meeting for 10 minutes was seconded and **passed**.

**Prof. Vernescu** (VPR, MA) agreed that it is important for the Nominator and Advocate to be in the committee to see how discussions progress in the event that, after a negative decision, further mentoring of the candidate is needed. He felt that the joint wisdom gained would increase the understanding of the outcomes.

**Prof. El-Korchi** (CEE) suggested that if each candidate's name were made known to his or her Department, then the Department could have input by sending letters about the case to COAP.

**Prof. Fehribach** (MA) **moved** to call the question. The motion was **seconded** and **passed**.

By paper ballot the motion **passed**.

#### 8. Adjournment

The meeting adjourned at 5:08pm.

Respectfully submitted,

Mark Richman  
Secretary of the Faculty

#### **Addendum on file with these minutes:**

##### **1. Addendum #1 COG Motion to Revise the Faculty Handbook Description of COAP**

**Date:** February 14, 2017

**To:** WPI Faculty

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

**Re:** Motion to approve the February 2017 undergraduate student graduation list

**Motion:** The Office of the Registrar reports that the following candidates have, as of February 3, 2017, completed all of the requirements for the degree designated in the department or program indicated and are eligible to receive that degree. Therefore, as Chair of the Committee on Academic Operations, I move that these students be approved for February 24, 2017 graduation.

### **Bachelor of Science**

#### **Actuarial Mathematics:**

Zachary Thomas Belisle  
Abrin Angelus Berkemeyer  
Minor: Business  
Erica D. Bowden  
Minor: Music  
Thomas Matthew Walter Danko  
Minor: Business  
Elizabeth A. Hansen  
Joseph Moynihan  
Kayla Mulready  
Minor: Business  
Amber Munderville  
Michael Sullivan  
Minor: Business  
Tyler Jacob Turchiarelli

#### **Aerospace Engineering:**

Carlie Rose Crawford  
Ian Andrew Limon  
Obadiah Njoroge Munene

#### **Biology and Biotechnology:**

Jennifer Rene Bombard  
Minor: Chemistry  
Josephine Cromartie  
David Michael Morgan  
Doreet Nagatti  
Kathleen Elizabeth Tran

#### **Biomedical Engineering:**

Nour Ali Krayem  
Javier A. Mazo Nido  
Nicolas Coelho Silva

#### **Chemical Engineering:**

Simon Escapa  
Concentration in Energy  
Minor: Mathematics  
Isaac Henry Vrooman

#### **Civil Engineering:**

Cory Spencer Adams  
Rania Attalla  
Christopher Angelo Scangas

#### **Computer Science:**

Dmytro Bogatov  
Minor: Economics  
Thomas Michael Finelli  
Steven Patrick Ireland  
Ying Lu  
Jean Marc Touma  
Xiaoren Yang

#### **Electrical & Computer Engineering:**

Narut Akadejdechapanich  
Minor: Computer Science  
Alexander Thomas Corben  
John DeCusati  
Kevin Chenery Farr, Jr.  
Petro Papi  
Kyle Drew Piette

**Electrical & Computer Engineering**

(cont.):

Jonas Rogers

Minor: Computer Science

Romuald Valme

Jamie Wang

Mariya Mikhailovna Zagalskaya

**Environmental Engineering:**

Kevin Gray

**Industrial Engineering:**

John Christopher Mastroianni

Minor: Business

Matthew Christopher Upham

Yi Yang

**Interactive Media & Game****Development:**

Charlie Bickle

**Interdisciplinary:**

Sonya Maria Douglas

Minor: Music

**Management Engineering:**

Patricio Janson

Concentration in Operations

Management

Sarah Terwilliger

Concentration in Mechanical

Engineering

**Management:**

Leif Erik Skramstad

**Mechanical Engineering:**

Christopher Earle Beauchemin

Yi-Min Chu

Alexander Church

Mengxi Han

Abdulahman Jilani

Concentration in Manufacturing

Frank James Kinzie IV

Kelsey Messina

**Mechanical Engineering (cont.):**

Edmund Christopher Resor

Minor: Manufacturing Engineering

Isabella Sanchez

Zachary Mark Temple

**Physics:**

Alejandro Emmanuel Leiro

**Robotics Engineering:**

Christopher Peter Bove

Ethan Benjamin Prihar

Minor: Music

Dabai Zhang

**Date:** February 14, 2017

**To:** WPI Faculty

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

**Re:** Motion to approve the February 2017 graduate student graduation list

**Motion:** The Office of the Registrar reports that the following candidates have, as of February 3, 2017, completed all of the requirements for the degree designated in the department or program indicated and are eligible to receive that degree. Therefore, as Chair of the Committee on Graduate Studies and Research, I move that these students be approved for February 24, 2017 graduation.

**Doctor of Philosophy**

**Biology and Biotechnology:**

Melissa Walsh Mobley

**Biomedical Engineering:**

Fan Zhang

**Chemical Engineering:**

Nicholas David Deveau  
Jason Michael Morgan

**Civil Engineering:**

Naser Pourakbar Sharifi

**Computer Science:**

Mahni Shayganfar  
Hao Wan

**Electrical & Computer Engineering:**

Travis Fredrick Collins  
Chenyun Dai

**Interdisciplinary:**

Raafat Mahmoud Zaini

**Materials Science and Engineering:**

Yinjie Cen  
Meinan He  
Baillie Rae McNally

**System Dynamics:**

Saeed Pourmasoumi Langarudi

**Master of Business Administration**

David Clinton Collins

Michael Andrew Conrad

David C. Fogaren, Jr.

Daniel J. Goncalves

Rio Hendarwan

Arun Prakash Jayabalakrishnan

Stephanie Pals Papia

Roshan George Thekkekunnel

**Master of Engineering**

**Biomedical Engineering:**

Matthew Alexander Babina

Stefano Berti Perez

Vivian Liang

Zachary Eugene Sellman

**Electrical & Computer Engineering:**

David Gann Marcus

John Arthur Michaud, Jr.

Vladimir V. Pechenyy

Richard Kyle Walker

**Power Systems Engineering:**

Douglas James Ayer

David George Melonson

Justin D. O'Kay

Michael Thomas Porcaro

Andrew Peter Simmons

Daniel William Neal White

Alex C. Worcester

Amir Zalloum

### **Master of Mathematics for Educators**

Francene Marie Gleason

### **Master of Science**

#### **Aerospace Engineering:**

Daniel Dean Thiesse

#### **Applied Statistics:**

Chuqin Huang

Nan Li

#### **Chemical Engineering:**

Tyler Trettel Howard

Alexander Nicholas Piscione Korpacz

#### **Civil Engineering:**

Peter James Eggleston

#### **Computer Science:**

William Robert Disanto

Lin Du

Zhongyuan Fu

Marc Evan Green, Jr.

Thomas William Grimshaw

Caitlin Anne Kuhlman

Qian Lu

Neha Satish Mahajan

Mingyan Zhao

#### **Data Science:**

Saber Jahanpour

Nikita Mutta

Harsh Vardhan Singh Gaur

Liang Zhang

#### **Electrical & Computer Engineering:**

LauraLee Austin

Ernesto Fiallo

Hristos Nikolaos Giannopoulos

Goutham Neelambaran Kodumudi

Srichandhru

Xiaoxi Li

Chao Ren

### **Electrical & Computer Engineering**

(cont.):

Timothy Michael Starr

Brian Michael Tomaselli

Andrew James Weiler

#### **Environmental Engineering:**

Colleen Elizabeth Heath

#### **Financial Mathematics:**

Yang Cui

#### **Fire Protection Engineering:**

Rebecca Mae Barolli

Jaclyn Grace Bouvier

Emily Grace Brecher

Anthony Michael Campanella, Jr.

Sumeet Kaur Chani, PE

Matthew Wheelock Foley

Connor Patrick Gillespie

Eli Samuel Horden

Stephen Thomas Maglione

Christopher Peter Tolentino

Sandra Christine Twilley

#### **Information Technology:**

James Matthew Cahill

Samuel Cano Trujillo

Yujing Cao

Bhakti Kirti Chheda

Shan He

Jasmeet Kaur

#### **Management:**

Keith Stephen Black

Justin Michael Chretien

Charles Martin Koutsogiane, Jr.

Bonham James Pierce

Sandra T. Taubert

#### **Manufacturing Engineering:**

Elias Karam

Christopher Antonio Sanchez

**Marketing & Technological Innovation:**

Zeynep Deniz Yalcin

**Marketing and Innovation:**

Lijia Huang

**Materials Science and Engineering:**

Mikaela Ann DeRousseau  
Kyle Leigh Fitzpatrick-Schmidt  
Derek George Tsaknopoulos  
Andrew Reed Vickery, Jr.

**Mechanical Engineering:**

Haidar Al Haddad  
Muhammad Kashif Azeem  
Nicholas Gary Burnell  
Andrew M. Cass  
Melissa Meg Castaneda  
Tyler Leon Crocker  
Andrew Paul Crouch  
Tobin James Dancy  
Christopher Darling  
Dylan Isaac Dziuba  
Nicholas Andrew Fast  
Sean Russell Greene  
Nicholas John Francis Keller  
Daniel Kenney Lane  
Richard Gregory Lupa  
Alexander Robert Maynard  
Sarah Rose Puch  
Vinicius M. Silva  
Andrew Thomas Skelly  
Diana Sobers  
Brad Warren Southard  
Todd Ellsworth Southard  
Shen Tian  
Cuong Tan Truong  
Brian Keith Wilson

**Operations Analytics & Management:**

Chang Liu  
Qianying Liu

**Operations Design & Leadership:**

Jiani Ding  
Emalee Claire Drake  
Julie Elizabeth Fehlmann

**Physics for Educators:**

Claudio Salazar

**Physics:**

Gawain Matsen Thomas

**Power Systems Management:**

Luai M. Elamir  
Mark Kiprono Korir  
Jordan Hans Shenk

**Robotics Engineering:**

Sean M. McGovern  
Joseph Peter McMahan  
Suriya Madhan Pachaimuthu  
Jacob Stewart Torrey  
Adela Hsien-Neng Wee

**Systems Engineering:**

Andre Michel Ajami  
Matthew Wallace Atwood  
Christine Marianne Fernandes  
Nathaniel Charles Gedney  
David Albert Gervais, Jr.  
Ryan Douglas Haack  
Zachary Perrone Lagadinos  
Brendan Thomas Lambert  
Joseph Patrick LiVolsi  
John Francis McInerney  
Frank James Murphy  
Zachary Peter Niforos  
Thomas Joseph O'Brien  
Jesse Jeremiah Otis  
Gregory Pasalides  
Ravi Rajendra Patel  
Joshua Elliott Pesch  
Kevin Bruce Rahn  
Mark Manuel Ramos  
Matthew Anthony Rocco

**Systems Engineering (cont.):**

Matthew Edward Schlitt

Steven E. Stewart

Donat A. Tetreault, Jr.

Kathryn Michele Tischer

Preston Bryant Tischer

Jamie Marie Wright

**Date:** February 14, 2017  
**To:** WPI Faculty  
**From:** Committee on Appointments and Promotions (Prof. Hansen, Chair)  
**Re:** Motion to modify the criteria for promotion to full professor

**Motion:** The Committee on Appointments and Promotions recommends and I move that the existing “Promotion: Criteria for Promotion in Academic Rank” (Handbook, Part Two, Section 1.D, page 2-7) be replaced with the following:

#### **D. Promotion**

The principal reason for establishing academic ranks is to recognize and to encourage the continued professional growth of individual faculty members. The faculty make a variety of scholarly contributions as educators, scholars, innovators and leaders that advance WPI’s mission to create, discover, and convey knowledge at the frontiers of academic inquiry for the betterment of society.

##### **D.1.1. The Criteria for Promotion**

The candidate for promotion to associate professor should have demonstrated high quality teaching and high quality scholarship/creativity as well as the promise for continued high quality performance in these areas. Evidence of service at an appropriate level is expected.

The candidate for promotion to full professor should demonstrate continuing high quality teaching and high quality scholarship/creativity as well as a record of scholarly contributions that demonstrates a positive external impact beyond WPI as appropriate to the candidate’s area of expertise. Evidence of service at a level appropriate to the rank is expected.

The specific standards of performance in teaching, scholarship, and service for promotion to full professor are similar to those for promotion to associate professor, with the added expectation of scholarly contributions that demonstrate a positive external impact beyond WPI. Contributions to WPI may demonstrate an external impact if they are disseminated and recognized externally. In every case, the high quality and positive external impact of scholarly contributions must be recognized by peers within WPI and by knowledgeable people external to WPI. While it is expected that these criteria describe the great majority of cases, there may be exceptional candidates whose unique contributions, while not conforming to these guidelines, are deserving of promotion.

##### **D.1.2. Definition of Scholarship**

To recognize the full range of scholarly contributions by faculty, WPI endorses an inclusive definition of scholarship. Scholarship exists in a continuum of diverse forms of knowledge and knowledge-making practices. Scholarship may be pursued through original research, making connections between disciplines, building bridges between theory and practice, communicating knowledge effectively to students and peers, or in reciprocal partnerships with broader communities. The common characteristics for any scholarly form to be considered scholarship are: it must be public, amenable to critical appraisal, and in a form that permits exchange and use by other members of the scholarly community.

Candidates for promotion may make contributions to the scholarship of discovery, the scholarship of integration, the scholarship of application and practice, the scholarship of teaching and learning, or the scholarship of engagement. Contributions may be in one area or across multiple areas of the continuum of scholarship. Scholarly contributions to any area or areas are valued equally by WPI.

The following descriptions of the continuum of scholarship indicate the scope of each domain, but they are not intended to be exclusive or exhaustive. The forms that scholarship take along this continuum will vary by discipline, department or academic division.

### **Scholarship of Discovery**

The creation or discovery of new knowledge involves creative and critical thought, research skills, the rigorous testing of researchable questions suggested by theory and practice, or active experimentation and exploration with the goal of adding to knowledge in a substantive way. The scholarship of discovery is usually demonstrated through publication in peer-reviewed journals and books, presentations at scholarly conferences, inventions and patents, or original creation in writing or multimedia, artistic works, or new technologies.

### **Scholarship of Integration**

The scholarship of integration includes the critical evaluation, synthesis, analysis, integration, or interpretation of research or creative work produced by others. It may be disciplinary, interdisciplinary, or multidisciplinary in nature. When disciplinary and interdisciplinary knowledge is synthesized, interpreted, or connected, this integrative scholarly contribution brings new insight. Integrative or interdisciplinary work might include articles, policy papers, reflective essays and reviews, translations, popular publications, synthesis of the literature on a topic, or textbooks. The scholarship of integration may be shared through any form such as those typical of discovery, application, teaching, or engagement.

### **Scholarship of Application and Practice**

Scholarship of application involves the use of a scholar's disciplinary knowledge to address important individual, institutional, and societal problems. The scholarship of application and practice might apply the knowledge, techniques, or technologies of the arts and sciences, business or engineering to the benefit of individuals and groups. This may include translational research, commercialization, start-ups, technology transfer, assistive technologies, learning technologies, or applied research supported by industrial or corporate partners or by government agencies. Contributions to the scholarship of application and practice are shared with stakeholders and open to review and critique by stakeholders and by peers.

### **Scholarship of Teaching and Learning**

The scholarship of teaching and learning is the development and improvement of pedagogical practices that are shared with others. Effective teachers engage in scholarly teaching activity when they undertake assessment and evaluation to promote improvement in their own teaching and in student learning. Scholarly teaching activity becomes the scholarship of teaching and learning when faculty members make their teaching public, so that it can be reviewed, critiqued and built on by others, through publications, presentations or other forms of dissemination.

### **Scholarship of Engagement**

The scholarship of engagement involves collaborative partnerships with communities (local, regional, state, national, or global) for the mutually beneficial exchange of knowledge and resources. Examples of the scholarship of engagement might include, but are not limited to: community-based programs that enhance WPI's curriculum, teaching and learning; educational or public outreach programs; other partnerships with communities beyond the campus to address critical societal issues, prepare educated citizens, or contribute to the public good. Contributions in the scholarship of engagement are of benefit to the external community, visible and shared with stakeholders, and open to review and critique by community stakeholders and by peers.

#### **D.1.3. Documentation in the Promotion Dossier**

The candidate for promotion to full Professor will submit a promotion dossier representative of their overall career, with an emphasis on work since tenure and/or promotion to Associate Professor. The candidate's promotion dossier will include the following: a curriculum vitae (CV); a personal statement of teaching, scholarship, service, and impact; a teaching portfolio to document high quality teaching; sample scholarly artifacts and a citation index and other indicators to demonstrate the high quality and external impact of the candidate's scholarly contributions.

- The **CV** provides comprehensive documentation of the candidate's professional experience and accomplishments in teaching, scholarship/creativity, and service.
- The **personal statement** provides a reflective summary and description of the candidate's professional accomplishments and scholarly contributions. Typically, the personal statement will include sections on teaching, scholarship/creativity, service, external impact, and future plans.
- The **teaching portfolio** provides documentation of the candidate's high quality teaching. A teaching portfolio presents representative teaching materials and evidence of their effectiveness. Typical elements in a teaching portfolio include a reflective statement of the candidate's approach to teaching and learning, samples of teaching materials, and measures of teaching effectiveness or materials that demonstrate student learning.
- The **sample scholarly artifacts** provide documentation of the high quality and external impact of the candidate's scholarly contributions. For most candidates, the sample scholarly artifacts will be three peer-reviewed articles that have been published since tenure and/or promotion. However, scholarly contributions may be documented and disseminated through a variety of artifacts besides peer-reviewed articles. The continuum of artifacts through which knowledge may be documented and disseminated matches, in its inclusiveness and variety, the continuum of scholarship. Sample scholarly artifacts must be publicly available, amenable to critical appraisal, and in a form that permits exchange and use by other members of the scholarly community.
- **Citation index and indicators of external impact.** All candidates for promotion must submit a citation index and any other indicators of external impact appropriate to their scholarly contributions. The citation index should include all citations of the candidate's publications, presentations or other scholarly contributions. Additional indicators of external impact might include reviews of the candidate's work, press and media coverage, downloads of scholarly materials, awards and recognition, or any other indicators that the candidate's scholarly contributions have had an impact beyond WPI.

Overall, the candidate should use this documentation to present the case that they have achieved the criteria for promotion. **Scholarly contributions may combine or cut across traditional categories of teaching, scholarship/creativity and service.** The candidate is invited and encouraged to use the promotion dossier to make arguments for the quality and impact of their work using these categories or in other ways if those other ways are appropriate to the form and impact of their scholarly contributions.

In addition to the above materials submitted by the candidate, the Joint Promotion Committee will add four **other sources of information** to the complete promotion review dossier: 1) Summary student ratings for all courses and projects taught at WPI in the last five years. 2) Responses to a teaching evaluation sent to a random selection of former students and alumni whom the candidate has taught in the last five years. 3) Instructional Activity Reports and Sponsored Research Activity Reports for the last five years. 4) Letters of appraisal solicited by the committee from internal and external peers for a confidential evaluation of the materials submitted by the candidate for the promotion dossier.

#### **D.1.4. Standards for Evaluation of the Promotion Dossier: Quality, Impact and Peer Review**

The candidate's promotion dossier and the criteria for promotion (sections D1.1 – D.1.4) will be sent to peers within WPI and to knowledgeable people external to WPI for an independent assessment of the quality and impact of the candidate's teaching, scholarship/creativity, and service. These letters of appraisal will be read only by people who are directly involved in the evaluation of the nomination for

promotion and they will not be shown to the candidate or to anyone else. This section provides additional guidance to reviewers for this assessment.

An assessment of **high quality teaching, high quality scholarship/creativity, and service** may be based on any and all material in the promotion dossier, including the CV, personal statement, teaching portfolio, peer-reviewed scholarship, peer reviews of sample scholarly artifacts, or indicators of external impact. Traditional measures to assess quality do not necessarily accommodate all areas of teaching, scholarship, and service. Nonetheless, the following six standards have been identified to evaluate quality across diverse areas: clear goals, adequate preparation, appropriate methods, significant results, effective presentation, and reflective critique (Glassick, Huber, and Maeroff, *Scholarship Assessed*, 1997). Since the dossier includes the candidate's reflective critique in their personal statement, peer reviewers are invited to apply these six standards to assess the candidate's teaching, scholarship and service in the promotion portfolio.

**External impact** beyond WPI should be assessed based on the relevant standards in the areas of the candidate's scholarly contributions. Thus, the starting point to assess external impact is the candidate's personal statement, which should identify the area or areas of their scholarly contributions across teaching, scholarship and service and indicate examples of external impact beyond WPI. While quantitative measures such as the number of refereed publications and citations or the level of external funding will remain important indicators of quality and impact for many scholars, WPI recognizes that the weight assigned to such measures varies widely between academic fields as well as along the continuum of scholarship. Thus, evidence of external impact beyond WPI might include: funding from multiple sources; peer-reviewed articles or presentations in well-regarded journals or conferences; books; reviews, citations or impact factors; downloadable curriculum; patents; films, broadcasts, software, or computer games; discussion of research in legal cases, policy reports, or the media; keynote addresses; workshops for other institutions, regional, national or international societies; artistic exhibitions, performances or productions; K-12 outreach and educational programs; journal editorships; leadership of academic programs or centers; or impact on external communities through teaching, scholarship or service. These examples of external impact are illustrative and do not limit other ways that a candidate might demonstrate external impact.

**Peer reviewers** should be experts in, and therefore appropriate evaluators of, the area or areas of the candidate's scholarly contributions. Where appropriate, external reviewers may include experts whose institutional affiliation is beyond the academy if they are well-placed to testify to or evaluate the quality and impact of the candidate's scholarly contributions.

All reviewers—internal and external peers, members of promotion committees, or academic decision-makers—are reminded that **implicit and explicit bias** has been shown to occur in every aspect of a faculty career that is evaluated. Empirical studies have shown that letters of recommendation for women and men differ in gendered ways: letters for women are often shorter, less detailed, and reinforce gender stereotypes. Women faculty and faculty of color also may face bias in student ratings of teaching or in mentoring and sponsorship. The choice of area for scholarly contributions (e.g. interdisciplinary, qualitative, community-engaged, theoretical, or digital) may result in comparatively less funding or fewer citations but nevertheless demonstrate high quality and impact in forms appropriate to that area of scholarship. The Committee on Appointments and Promotions highlights potential sources of bias in this description of the standards for evaluation of the promotion dossier so that all reviewers at every stage of the review process will be aware of potential implicit and explicit bias and take care to limit opportunities for such bias to influence the consideration of each nomination for promotion.

[End of Motion]

## Rationale:

This motion is one of several to be offered by the Committee on Appointments and Promotions. Changes to nomination procedures for promotion will be proposed separately. The existing criteria for promotion require high quality teaching and high quality scholarship/creativity, demonstrated leadership in one of those areas, and some appropriate degree in activities of service to WPI.

To provide improved clarity for the criteria for promotion to full professor, this motion:

- Reasserts the dual importance of high quality **teaching** and high quality **scholarship/creativity**
- Redefines leadership as scholarly contributions with an **external impact beyond WPI**
- **Broadens** the definition of **scholarly contributions** along a continuum of *discovery, integration, application and practice, teaching and learning, or engagement* and across the categories of teaching, scholarship, and service
- Expects a level of **service** appropriate to the rank
- Defines material for the **promotion dossier** and provides standards for the **evaluation of quality and impact**
- Articulates an inclusive definition of **peer reviewers**
- Highlights and attempts to limit the role of **implicit or explicit bias** in a promotion review
- Affirms that **exceptional candidates** whose unique contributions, while not conforming to these guidelines, may be deserving of promotion

**High quality teaching and high quality scholarship** continue to be required for promotion to full professor because both are essential to the mission of WPI. Tenured faculty are expected to make contributions to all areas of teaching, scholarship, and service. Without continuing scholarly contributions from the tenured faculty, WPI cannot fulfill its mission to educate men and women and to create, discover and convey knowledge for the public good. WPI does not award tenure and promotion to associate professor for high quality contributions in one area only. Likewise, WPI does not award promotion to full professor without continuing contributions of high quality in both teaching and scholarship/creativity. This longstanding commitment to excellence in teaching and scholarship is one of WPI's greatest strengths and most precious assets. The commitment by the faculty to high quality teaching and high quality scholarship is directly responsible for WPI's outstanding academic reputation and its recent recognition by the *Wall Street Journal* as the best school in the nation for combining scholarly research with classroom instruction.

**External impact** beyond WPI defines the standard by which to judge when high quality scholarly contributions reach a threshold that merits promotion to full professor. In the past, "leadership" in teaching or scholarship has been considered problematic, especially for someone putting forward a case for promotion based on leadership in teaching. Excellent teaching by itself does not indicate leadership without demonstrating external dissemination and impact. Teaching and learning is a well-developed area of scholarship, and its quality and impact can be assessed by peers within WPI and by knowledgeable people external to WPI, like any other form of scholarship. External impact beyond WPI is specific enough to motivate faculty to make contributions that are disseminated and recognized beyond our campus and flexible enough to accommodate a variety scholarly contributions.

**Scholarship is defined along a continuum** in order to recognize and reward the variety of scholarly contributions made by faculty. Scholarly contributions may be in any one area or in multiple areas across the continuum of the scholarship of discovery, integration, application and practice, teaching and learning, and engagement. Inclusive categories of faculty work have been the subject of a wide-ranging discussion in the academy since Ernest Boyer published *Scholarship Reconsidered: Priorities of the Professoriate*, in 1990. The extensive scholarly literature on rewarding multiple forms of scholarship has strongly influenced the development of this motion and the inclusion of sections on the definition of scholarship, documentation and evidence, standards for evaluation in peer review, and the acknowledgment of bias.

Scholarly contributions may combine and cut across traditional categories of teaching, scholarship and service. As a result, this motion **elevates the importance of scholarly contributions**

**such as project advising**, which too often is viewed only as a form of “teaching.” Project advising is teaching, but it also can be scholarship. After more than four decades of leadership in project-based education, WPI faculty have made nationally and internationally recognized contributions to the scholarship of teaching and learning and to the scholarship of engagement. These scholarly contributions have been recognized externally and should be rewarded at WPI by including these domains in our criteria for promotion.

The criteria expect candidates for full professor to provide “evidence of service at a level appropriate to the rank.” **Service remains a critical responsibility** of all tenured and tenure-track faculty. Over the past year, the committee considered language that would have required high quality, significant, or substantial levels of service, and consistently received feedback that such expectations would be unclear, “raise the bar,” and be unreasonable as standards for promotion. Some candidates will emphasize contributions to departments or programs, others to faculty governance, and still others to professional societies. It is impossible to define a criterion for service that gives extra weight to institutional service to WPI that would not be arbitrary and would not disadvantage candidates whose appropriate level of service took other forms.

Instead, this motion acknowledges that the **level of service appropriate for promotion to full professor is contextual to each candidate’s unique contributions**. Long before seeking nomination for promotion, each faculty member should discuss with their department head, dean and other mentors the appropriate level and form of service in their individual case. Integrating service into an inclusive definition of scholarship and impact also provides multiple pathways to recognize and reward as “scholarly contributions” the very same activities that otherwise might be disparaged or devalued as “service.” Even institutional service to WPI may be disseminated, assessed and exchanged or used by others in the wider scholarly community.

Each candidate for promotion should use the **documentation in their promotion dossier** to define the area(s) of their scholarly contributions and to document external impact. New sections in these criteria on the promotion dossier and the standards for its evaluation by internal and external peer reviewers also should provide clarity for candidates. At present, candidates are already asked to provide a CV, personal statement, teaching portfolio, three scholarly articles, and a citation index. The motion provides flexibility by specifying that artifacts beyond articles and indicators beyond citations may be submitted. It is up to the candidate to make the case for the high quality and external impact of their scholarly contributions.

Please note that the evaluation of “**scholarly contributions**” **does not mean only traditional indicators of “scholarship.”** The section on the standards of evaluation of the promotion dossier clearly states that the assessment of teaching, scholarship, and service may be based on any and all material in the dossier and notes the diversity of scholarly indicators of quality and impact. The diversity of indicators matches the diversity of scholarly contributions. The category “scholarly contributions” *includes* teaching, scholarship, and service and thus attempts to move beyond the stale, unproductive, and corrosive debate of “teaching” versus “research.” Put plainly, WPI cannot be an institution worthy of its outstanding reputation and high aspirations if the scholarly contributions of faculty are not recognized by external peers for high quality and external impact.

An inclusive definition of scholarly contributions marks a bold step by WPI to provide **multiple pathways to professor, especially for women faculty**. Several studies indicate that women faculty are more likely to be promoted to full professor when the criteria are broadened to include teaching, engagement, and inclusive definitions of scholarship. In addition, by highlighting for all reviewers the adverse effect of implicit or explicit bias on candidates for promotion (especially on women faculty and faculty of color), the proposed criteria should help to limit the influence of such bias during the review.

The criteria also affirm that **exceptional candidates** whose unique contributions, while not conforming to these guidelines, may be deserving of promotion. The existing criteria contain a similar statement: “While these criteria serve as general guidelines, outstanding candidates should not be deprived of promotion because of the uniqueness of their contribution.” Some have asked whether such statements merely provide the illusion of flexibility. Flexibility is not an illusion, and its opposite—inflexibility—would not be an improvement. In fact, flexibility in the promotion criteria has been important in the past and should remain available in the future.

Fundamentally, this motion embodies the faculty's commitment to the mission of WPI. The criteria provide multiple and flexible paths for promotion and recognize the variety of scholarly contributions by faculty. If these flexible paths and variety of scholarly contributions all demonstrate high quality and external impact, each in their own way, then WPI will be well positioned in the coming years to recognize and encourage the professional development of individual faculty members and to elevate its stature, enhance its reputation, and be recognized the world's leading global polytechnic.

### **Implementation**

These criteria would take effect for nominations for promotion in the 2017-18 academic year. If approved, the committee will work with other units at WPI to schedule workshops on the development of teaching portfolios, the continuum of scholarship, and the role of implicit and explicit bias.

**Appendix: Consent Agenda Motions**

**Date:** February 14, 2017

**To:** WPI Faculty

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

**Re:** Motion to permit double-majors in HU&A and International and Global Studies

**Motion:** On behalf of the Humanities and Arts Department and the International and Global Studies Program, the Committee on Academic Operation recommends and I move that the restriction on double-majors in Humanities and Arts and International and Global Studies be removed from the undergraduate catalog, as described below.

**Description of the proposed change in language in the Undergraduate Catalog:**

*Existing Double Major Description:*

The Undergraduate Catalog (2016-17, p. 12) lists double-major combinations that are not allowed by departments and programs. This list includes:

- Humanities and Arts and International and Global Studies

*Proposed Double Major Description:*

The double major in Humanities and Arts and International and Global Studies would be removed from the list of combinations that are not allowed.

**Rationale:**

In 2015-16, the Committee on Academic Operations (CAO) surveyed departments and programs with majors in the list of double-major combinations that are not allowed. When the International Studies major was created 20 years ago, almost all the relevant courses were in Humanities and Arts, with some in Social Sciences. At that time, the completion of the MQP in International and Global Studies (INGGS) served as a substitute for completing a Sufficiency Project, just like the MQP in Humanities and Arts (HUA). As a result, this combination was then included in the list of prohibited double-majors.

Since then, several things have changed. First, there are many relevant courses in social sciences, business, and the First-Year program. Second, all students now complete the Humanities and Arts Requirement, including students majoring in either HUA or INGS. And finally, two students successfully petitioned CAO to complete a double major in Humanities and Arts and International and Global Studies in the past. One of these students had an HUA concentration in music and the other had an HUA concentration in Hispanic studies. In both cases, these petitions demonstrated that this combination of majors were sufficiently distinct. The prohibition on this double-major combination should be removed from the undergraduate catalog.

**Implementation Date:** Implementation date for this action would be the 2018-19 catalog.

**Date:** February 14, 2017

**To:** WPI Faculty

**From:** Committee on Graduate Studies and Research (Prof. K. Troy, Chair)

**Re:** Motion to add PH 585 Scientific Writing and Proposal Development

**Motion:** On behalf of the Physics Department, the the Committee on Graduate Studies and Research recommends and I move that PH 585 Scientific Writing and Proposal Development, as described below, be added.

**Proposed Course Description:**

**PH 585** Scientific Writing and Proposal Development, one graduate credit

This course will cover key elements of writing successful grant or fellowship proposals, as well as manuscripts. The topics that will be covered will include project development, identification of funding agencies or journals, proposal and manuscript writing and editing, as well as aspects of the submission and review process. Students will be expected to develop a proposal, and participate in reviews. Students are expected to complete this course prior to taking the Ph.D. Qualifying Exam in Physics.

**Recommended background:** A bachelor's degree in science, technology, engineering, or mathematics.

**Anticipated Instructor:** Prof. Erkan Tüzel, Prof. Qi Wen, Prof. Lyubov Titova, Prof. David Medich, Prof. Douglas Petkie, Prof. Germano Iannacchione (team taught)

**Rationale:**

Most graduate students need practice with their writing skills, which is essential for their professional development. This course gives the students practice and feedback on writing proposals and manuscripts, whether they preparing for a Qualifying Exam or submitting a fellowship to a funding agency.

**Implementation Date:** 2016-17 academic year, Spring semester

**Resource Needs:** The class meets for one hour each week in the Physics Department's conference room. The course enrollment is limited to 8 students. The anticipated offering schedule is annually either in the fall or spring semesters.

**Impact on Distribution Requirements and Other Courses:** This course emphasizes professional and writing skills, and current topics.

**Date:** February 14, 2017

**To:** WPI Faculty

**From:** Committee on Graduate Studies and Research (Prof. K. Troy, Chair)

**Re:** Motion to add PH 798 Comprehensive Written Examination

**Motion:** On behalf of the Physics Department, the Committee on Graduate Studies and Research recommends and I move that PH 798 Comprehensive Written Examination, as described below, be added.

**Proposed Course Description:**

**PH 798** Comprehensive Written Examination (zero graduate credit)

Comprehensive Written Examination prepared, administered and evaluated by the Physics Department Graduate Committee (PDGC).

**Recommended background:** Student should be enrolled in the Physics Graduate program, either seeking an M.S. degree with no-thesis option, or a Ph.D. degree.

**Anticipated Instructor:** Physics Department Graduate Committee (PDGC) Chair.

**Rationale:**

This zero-credit course will help both the department and the registrar keep track of graduate degree requirements.

**Implementation Date:** 2017-18 academic year.

**Resource Needs:** During the semester, students work independently to prepare for the Comprehensive Written Examination offered at the end of the semester. The course enrollment is limited by the number of students enrolled in the physics graduate program. The anticipated offering schedule is annually in both the fall and spring semesters.

**Impact on Distribution Requirements and Other Courses:** None. This course is for tracking purposes only.

**Date:** February 14, 2017

**To:** WPI Faculty

**From:** Committee on Graduate Studies and Research (Prof. K. Troy, Chair)

**Re:** Motion to add PH 799 Ph.D. Qualifying Examination

**Motion:** On behalf of the Physics Department, the Committee on Graduate Studies and Research recommends and I move that PH 799 Ph.D. Qualifying Examination, as described below, be added.

**Proposed Course Description:**

**PH 799** Ph.D. Qualifying Examination (zero graduate credit)

Students are required to write and defend an original research proposal before a committee representative of the area of their specialization, approved and appointed by the Physics Department Graduate Committee (PDGC).

**Recommended background:** Student should be enrolled in the Physics Graduate program, seeking a Ph.D. degree.

**Anticipated Instructor:** Physics Department Graduate Committee (PDGC) Chair.

**Rationale:**

This zero credit course will help both the department and the registrar keep track of graduate degree requirements.

**Implementation Date:** 2017-18 academic year.

**Resource Needs:** Students will be required to enroll in this class during the semester they are scheduled to take the Ph.D. Qualifying Examination, and will work independently to prepare. The course enrollment is limited by the number of students enrolled in the physics graduate program. The anticipated offering schedule is annually in both the fall and spring semesters.

**Impact on Distribution Requirements and Other Courses:** None. This course is for tracking purposes only.

**Date:** February 14, 2017

**To:** WPI Faculty

**From:** Committee on Graduate Studies and Research (Prof. K. Troy, Chair)

**Re:** Motion to change Physics M.S. and Ph.D. Degree Requirements

**Motion:** On behalf of the Physics Department, the Committee on Graduate Studies and Research recommends and I move that the “Degree Requirements” section in the Graduate Catalog (pp. 153 of the 2016-17 Graduate Catalog) be modified as listed below.

**Description of Revisions to be included in Graduate Catalog** (Additions in underline, deletions ~~struck through~~):

### *Degree Requirements*

#### **For the M.S.**

The M.S. degree in physics requires 30 semester hours of credit: 6 or more in thesis or directed research with the remainder in approved courses and independent studies, to include PH 511, PH 514, PH 515, PH 522 and PH 533 (15 semester hours). ~~The thesis option requires the completion and defense of a M.S. thesis as well as a seminar presentation based on the thesis research. The seminar and defense may be done in conjunction. The non-thesis option requires a satisfactory performance on the Qualifying Examination.~~

All full-time students are required to register for the zero-credit graduate seminar (PH 580) every term. The thesis option requires the completion and defense of an M.S. thesis as well as a public seminar presentation based on the thesis research. This option also requires a thesis committee formed by the end of the first year by the student and the research advisor, with the approval of the *Physics Department Graduate Committee (PDGC)*. The committee will consist of three faculty members (including the advisor), will be responsible for overseeing the progress of the student towards a successful completion of their degree, and provide mentoring. The non-thesis option requires students register for and pass the *Comprehensive Written Examination (PH 798)*.

#### ***For the Master of Science in Physics for Educators (MPED)***

For a complete overview of degree requirements, please see STEM for Educators.

#### ***For the Ph.D.***

The doctor of philosophy degree requires 90 credit hours, including 42 in approved courses or directed study (which must include PH 511, PH 514-515, PH 522 and PH 533, or their equivalents), 30 of dissertation research, and completion and defense of a Ph.D. thesis. Courses taken to satisfy M.S. degree requirements may be counted against the required 42 credits of courses, but completion of a M.S. degree is not required.

~~One year of residency and passage of a qualifying examination are required.~~

~~A minimum of 60 credits must be earned at WPI.~~

All full-time students are required to register for the zero-credit graduate seminar (PH 580) every term. Upon approval of the Physics Department Graduate Committee (PDGC), a maximum of 1/3 of the credit requirements outlined above may be satisfied by transferring graduate courses completed at other accredited, degree-granting institutions, provided they were not used to satisfy degree requirements elsewhere. Students entering with M.S. degrees may be required to take some or all of the core courses as part of their total 60 credits requirement, as determined by the PDGC upon review of the M.S. coursework.

The PDGC reviews each student's academic work on an annual basis, and the committee and the academic or research advisor may require additional coursework to address specific deficiencies in the student's background. Students must maintain a minimum of a 3.0 GPA to be in good standing. One year of residency in the program is required.

A brief description of other Ph.D. program requirements follows below.

### **Comprehensive Written Examination**

Students entering the Ph.D. program are required register for and pass the *Comprehensive Written Examination* (PH 798) no later than the end of their second year (no more than 3 attempts allowed). This exam is designed to test a student's comprehension of core physics curriculum, and is prepared, administered and evaluated by the PDGC. It is offered twice a year, during Fall and Spring semesters.

~~The Qualifying Examination for the doctor of philosophy degree is usually administered each year at the beginning of the second semester. Ph.D. aspirants who enter after the bachelor's degree may take the examination during their first year of graduate school, and are expected to take the examination by the end of their second year. There is no penalty for failing or not taking the examination during the first year. Students who fail the examination during their second year must pass the examination when it is next offered. The Qualifying Examination will include, but is not limited to, material taken from PH 511, PH 514-515, PH 522 and PH 533. Each student's academic work is reviewed on an annual basis by the Physics Department Graduate Committee. Continuation of student status is based on satisfactory progress toward a degree, coursework, research, teaching, and service to the Department. Renewals of research and teaching assistantships are dependent on satisfactory performance of required duties.~~

### **Ph.D. Qualifying Examination**

No later than the end of the third year after formal admittance to the Ph.D. program, students are required to register for and pass a *Ph.D. Qualifying Exam* (PH 799) in which the students are required to write and defend an original research proposal before a committee representative of the area of their specialization, approved and appointed by the PDGC. The students are allowed only two attempts to pass this exam. The examination is used to evaluate the ability of the student to pose meaningful scientific questions, to propose experimental or theoretical methods for answering those questions, and to interpret the validity and significance of probable outcomes of these theoretical conjectures, models or experiments. The committee will consist of a minimum of three physics faculty members including the advisor, and at least one faculty member from outside the department, and will administer and evaluate the exam. The research advisor cannot be the chair of this committee. The students are also required to take and pass a one-credit scientific writing course (PH 585) prior to their first attempt at taking the Ph.D. Qualifying Exam.

## **Ph.D. Dissertation**

To fulfill the final Ph.D. degree requirement, the candidate must submit and defend a satisfactory dissertation to the dissertation committee formed in consultation with the research advisor, and approved by the PDGC. This committee will consist of a minimum of three physics faculty members including the advisor, and at least one faculty member from outside the department. The research advisor cannot be the chair of this committee.

## **Course Descriptions**

All courses are 3 credits unless otherwise noted.

Note: Students must maintain a minimum of a 3.0 GPA to be in good standing.

### **Rationale:**

Many physics departments nationwide, and the majority of the departments at WPI (Biomedical Engineering, Biology and Biotechnology, Chemistry, etc.), offer some form of a research-based writing-intensive qualifying exam to their Ph.D. students, which also contains an oral presentation. The goal of this exam is to test the students' abilities in developing, writing and presenting an original research based proposal, and encourages critical thinking which is essential for research. In order to improve the quality and rigor of the Physics Ph.D. program, and prepare our students better a successful outcome of their Ph.D., we propose a new Ph.D. Qualifying Examination as briefly outlined in the modified degree requirements. In order to improve the writing skills of our students, a new one-credit course (PH 585 – Scientific Writing and Proposal Development) will be offered. This course will be required for students taking the Ph.D. Qualifying Exam, and will be team-taught by several faculty members.

This new exam will be in addition to the existing core-curriculum based problem solving exam, which currently serves as the qualifying examination. A two-exam structure is very common in physics departments across the nation, since a good grasp of the core physics curriculum is equally important as research potential of the student. In order to avoid confusion, this traditional exam will be referred to as the *Comprehensive Written Examination*.

Both exams are described in separate sections in the new version of the degree requirements, outlining the times they can be taken, the timelines, how they are prepared, administered and evaluated. In the case of the Ph.D. Qualifying Examination, the composition and the role of the exam committee is also described.

In order to improve the book-keeping of multiple exams, in consultation with the Registrar, we propose to implement two zero-credit courses for these exams (*Comprehensive Written Examination - PH 798, Ph.D. Qualifying Exam - PH 799*). These courses will not only improve tracking degree requirements by the Physics Program and the Registrar, but will also reveal student progress towards their degree on their transcripts.

The composition, the roles, and the selection of the M.S. and Ph.D. dissertation committees are also described more clearly. In addition, all full-time M.S. and Ph.D. students are required to register for a zero-credit graduate seminar course (PH580, approved by the Faculty recently). Together, all these changes increase the rigor of the physics graduate program, and bring it on a similar level with many of the leading physics programs in the nation.

**Resources and Anticipated Instructors:** The new research-focused Ph.D. Qualifying Exam represents an incremental increase in faculty load as they would participate in exam committees. However, since the students will be better selected and trained, this will ease the load of the faculty in advising them for their Ph.D. In addition, the relatively small size of the physics Ph.D. program (<20 students), and the student-faculty ratio in the department, we do not anticipate this be a major burden on the faculty.

The proposed scientific writing course will be team taught by Prof. Erkan Tüzel, Prof. Qi Wen, Prof. Lyubov Titova, Prof. David Medich, Prof. Douglas Petkie, and Prof. Germano Iannacchione.

The zero-credit exam courses are merely for tracking purposes only, and do not impose any additional load on the faculty. In fact, more efficient degree requirements tracking reduces the workload of the faculty in the Physics Department.

**Implementation Date:** Implementation date for this action is the Fall semester of the 2017-2018 academic year.

**Date:** February 14, 2017  
**To:** WPI Faculty  
**From:** Committee on Graduate Studies and Research (Prof. K. Troy, Chair)  
**Re:** Motion to convert OIE 598 Sp. Topics to OIE 559 Optimization Methods for Business Analytics

**Motion:** On behalf of the Foisie School of Business, the Committee on Graduate Studies and Research recommends and I move that special topics course OIE 598 Optimization Methods for Business Analytics be converted to a permanent course OIE 559 Optimization Methods for Business Analytics, as described below.

**Proposed Course Description** (identical to description for OIE 598):

**OIE 559 Special Topics: Optimization Methods for Business Analytics**

This course covers mathematical optimization in greater detail beyond the foundational concepts of linear programming. A variety of optimization problem classes will be addressed, likely including integer programming, nonlinear programming, stochastic programming and global optimization. While ensuring an appropriate level of theory, the main emphasis will be the methodological and computational aspects of solving such problems arising in the operational, manufacturing, and service sectors. Recommended background: Previous course(s) in linear algebra, basic knowledge about optimization and linear programming, or consent of the instructor.

**Rationale:**

FBS restructured the MS in Operations Analytics and Management (MSOAM) in fall 2015 to better define our focus on business analytics. This has led to an increase in MSOAM students from 38 in fall 2015 to 53 in fall 2016. The MSOAM was also STEM certified in fall 2015 so we anticipate continued growth. *Optimization Methods for Business Analytics* is a key elective course within the MSOAM, particularly for students seeking Business Analyst positions, which is the case with many of our younger MSOAM students. The course has been well-received to date and enrollment has been steady enough to support making it a permanent offering.

Key information concerning the course offerings is summarized in the table below:

Course	Title	Offerings	Proposed Course #	Evaluations			
				Spring 2014	Spring 2015	Spring 2016	
OIE 598	Optimization Methods for Business Analytics	3	OIE 559	Q1	4.6 (n=9)	4.6 (n=19)	4.7 (n=13)
				Q2	4.7 (n=9)	4.6 (n=18)	4.7 (n=13)
				Q9	4.8 (n=9)	4.4 (n=17)	4.5 (n=13)
				Q17	5 (n=9)	4.7 (n=18)	4.8 (n=13)
				Enrollment	9	19	13

**Q1:** Overall Rating of Course Quality

**Q2:** Overall Rating of Instructor’s Teaching (WPI average ≈ 4.2 depending on semester / year)

**Q9:** Amount Learned from the Course (Relative to Other Courses)

**Q17:** Instructor Was Well Prepared to Teach Class

**Resources Required:** No new resources are required. The course has been previously taught by Prof. Andrew Trapp, and it is anticipated that he will continue teaching the course.

**Implementation Date:** The 2017 – 2018 academic year.